American Machinist

DECEMBER 16, 1948

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Induction-annealing chain pins at 20 per min.—see page 2

- **Horizontal Broaching Fixtures — A SPECIAL REPORT**
- **Precision Dies Mass-Produce Die Castings**
- **Practical Inspection Lowers Scrap, Rework**

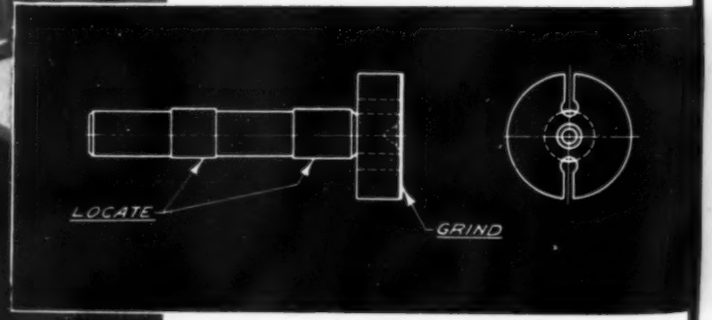
PRECISION and PRODUCTION in the PLUS COLUMN

Heald Column Type Rotary Surface Grinder Replaces TWO other types of Machines—*at a nice profit to the manufacturer*

Doing a better job, faster, with less equipment is industry's answer to the increasing problem of producing goods at a profit. Here's a typical case where Heald engineering accomplished this for a compressor manufacturer—with the Model 261 Rotary Surface Grinder shown at the left. This new Heald machine grinds compressor rotors, 16 at a time, to a .000030 tolerance for flatness; .0006 for thickness; and .00015 for squareness with the shaft. The rapid automatic cycle, multiple station fixture, and complete ease of operation, have materially aided in speeding up production. And, as is so often the case, this one Heald machine does the work of two machines previously used for the same operations.

Why not see what a new Heald machine can do for *your* grinding operations? Your nearest Heald representative—or our engineers here at Worcester—will be glad to help you.

This Heald Model 261 Column Type Surface Grinder is just one of over 30 new Heald grinders and Bore-Matics especially designed for your precision production requirements.



Line drawing of compressor rotor, showing the surface precision ground to tolerances mentioned above

HEALD

THE HEALD MACHINE COMPANY, Worcester 6, Mass.

Branch Offices in Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

TECHNOLOGY DEPARTMENT

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

PUBLIC LIBRARY
DEC 17 1948
DETROIT

BURNHAM FINNEY .....Editor
E. J. TANGERMAN.....Managing Editor

•

Associate Editors: RUPERT LE GRAND, BEN C. BROSHEER (Chicago), ANDERSON ASHBURN, H. E. LINSLEY, CHESTER S. RICKER (Detroit), J. J. McGUINNESS (News), MILES J. ROWAN

•

Assistant Editors: CHARLES D. EMERSON, EILEEN ERSHLER

•

SYDNEY OXBERRY.....Art Director
RICHARD ROOMAN .....Assistant
ANNE PALMER .....Makeup

•

DEXTER KEEZER..Director, Economics Dept.

•

JOHN CHAPMAN....World News Director

•

GEORGE E. DOYING, JR.....Washington

•

FRED H. COLVIN.....Editor Emeritus

•

ALBERT HAUPTLI, JR. .....Publisher
WILLIAM E. KENNEDY.....Asst. Publisher

•

District Managers: JOHN H. KOCH, M. A. WILLIAMSON, JR., Statler Building, Boston, Mass.; JAMES A. McGRAW, HUGH BRITTON, 330 W. 42nd St., New York 18, N. Y.; DAVID G. JONES, Architects Bldg., 17th & Sansom Sts., Philadelphia 3, Pa.; RAY DEEN, ANSON E MEANOR, 520 N. Michigan Ave., Chicago, Ill.; ADOLPH F. TISCHER, Hanna Bldg., Cleveland, O.; ROBERT H. ANDERSON, 1110 Delta Ave., Cincinnati, O.; PHILIP G. WEATHERBY, Penobscot Bldg., Detroit, Mich.; JOHN W. OTTERSON, 68 Post St., San Francisco, Calif., CARL DYSINGER, 621 So. Hope St., Los Angeles, Calif.; R. C. MAULTSBY, Rhodes-Haverty Bldg., Atlanta, Ga. Other offices: Continental Bldg., St. Louis, Mo.; National Press Bldg., Washington, D. C.; Oliver Bldg., Pittsburgh, Pa.; Aldwych House, Aldwych, London, W.C. 2.

•

Member of the Associated Business Papers and the Audit Bureau of Circulations.

•

COPYRIGHT 1948 by McGraw-Hill Publishing Company, Inc. All rights reserved.

•

Published every other Thursday. Price 35c per copy. Allow ten days for change of address. Subscription Rates: United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada, $6 for one year, $10 for two years, $12 for three years. Pan-American countries, $10 for one year, $16 for two years, $20 for three years. All other countries, $20 a year, $30 for two years, $40 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter, August 13, 1943, at Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U.S.A. Return postage guaranteed.

American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index.

CONTENTS for DECEMBER 16, 1948 ... VOL. 92, NO. 26

Cover .....*Operation pictured is described on page 2*

ADMINISTRATION

Editorial .....*Burnham Finney* 75
For High Wages, Full Employment.....*J. H. McGraw, Jr.* 92
Men Only? .....*Round Table* 119

SPECIAL REPORT

A Handbook of Horizontal Broaching Fixtures....*Ben C. Brosheer* 93

ENGINEERING

Ammeter Load Gage Shows Tool Condition..*Chandler A. Phillips* 121
Weight Tables for Screw-Machine Products.....*(RBS)* 135

INSPECTION AND ASSEMBLY

Liquid Nitrogen Simplifies Bearing Assembly....*R. E. Bludeau* 82
Practical Inspection Lowers Scrap and Rework.....*Jack Shafer* 112
How to Treat a Gage..... 116
New Welding Arm Spots Holding Strips.....*T. E. Tyler* 122
Workholding Stand Eases Brazing Operations..... 124

MATERIAL CUTTING, FORMING

Problems in Shaving Fine-Pitch Gears.....*Louis D. Martin* 84
How Large Gears Are Shaved.....*George P. Maurer* 90
Radials Cut Boring Costs 24.3%..... 109
Double Punch Blanks and Pierces Rubber Washers.*Joseph Budnick* 121
Eccentric Pins Level Work on Grinder.....*Harold W. Cutting* 122

MATERIALS HANDLING

Ice Tongs Hoist Heavy Loads.....*G. R. Milner* 124

TOOLING

Precision Dies Mass-Produce Die Castings.....*Harold E. Nagle* 77
Short Cuts .....*A. H. Waychoff* 83
Precision Fixture Centers Cylindrical Grinds.....*Allan B. Nixon* 120
Wheel Fixture Gages Tapers.....*H. Moore* 120
Clapper-Box Sideplay Halted By Brass Screws....*A. D. Rayment* 121
Carbide Bit Has Four Edges.....*Walter Dimitruk* 123
Lock Washer Stop Really Stops.....*Dominick Pernini* 123
Midget Vise Clamps Small Die Work.....*Clifford T. Bower* 123

NEWS OF METALWORKING

Spot News 71
Gaging Metalworking..... 72
Detroit News 130
Names in the News..... 131

DEPARTMENTS

Talking Shop 89
Tips to Top Shop Men..... 118
Reference Book Sheets.... 135
Shop Equipment News..... 141
Parts and Materials..... 163
Round Table Discussions... 166
New Books..... 172

PUBLISHED BY McGRAW-HILL PUBLISHING COMPANY, INC.
330 West 42nd St., New York 18, N.Y. Cables: "McGRAW-HILL, NewYork"

James H. McGraw (1860-1948), Founder; James H. McGraw, Jr., President; Curtis W. McGraw, Vice-President and Treasurer; Eugene Duffield, Executive Assistant for Publications; Nelson Bond, Director of Advertising; Joseph A. Gerardi, Secretary; J. E. Blackburn, Jr., Director of Circulation

Chips and QUIPS

Our Cover . . . Both ends of 1200 Whitney chain pins per hour are annealed without affecting hardness of the center in this automatic setup. Pins are aligned by the centrifugal hopper and fed into notches in the indexing wheel. This carries pins past two induction coils which anneal both ends. Current is supplied by a standard Westinghouse 20-kw., 450-kc., radio-frequency generator. A battery of three such units handled 29 million pins in a year, each working at almost five times the former rate with salt bath. These machines require an operator only intermittently, so can be placed directly in the production line. An adjustable speed mechanism permits handling of a wide range of pin sizes.

Companion . . . Last January, Associate Editor Brosheer described principles and illustrated examples of fixtures for vertical broaching in two special reports . . . We felt that we should round out the story by picturing the older brother—horizontal broaching, so have done so in the special report in this issue. Reprints will be available as usual.

Radials Quarter the Costs . . . Last spring, on a visit to Reed-Prentice Corp., Worcester, Mass., we saw a group of radial drills complete with trunnion jigs and quick-change collet chucks, working on production like beavers. Inquiry showed they'd cut machining costs on steel-cast die-caster parts about a quarter, so we started after the story . . . Two further visits, many flash bulbs and some expensive sketches later, we bring you the story in compact form, highlighting principles to cut your "idea-getting" time.

Indians . . . Experience indicates that most of our readers are most interested in an old Indian expression, "How?" Louis D. Martin, gear engineer for the Camera Works, Eastman Kodak, explains gear shaving and its application to fine-pitch gears, shows typical jobs and problems . . . George Maurer, who is responsible for gear quality at Falk Corp., details his company's experiences and developments in shaving gears up to 96-in. diameter . . . Professor MacCrehan, in charge of the Gage Lab. at New York University, gives down-to-earth suggestions on the care of gages.

Inspection . . . Jack Shafer (see biog.), supt. of inspection at Jack & Heintz, tells how his company has applied statistical quality control to manufacture.

At each machine is a chart with the nominal dimension at the center, the plus and minus allowances forming the edges. An inspector periodically picks random samples and charts them. Thus a trend is indicated, machine by machine, which warns of developing divergence and the need for tool redressing or resetting. That's called "process control" . . . There's also an unusual acceptance scheme, involving testing ten parts at random. If rejects are too high, a larger batch is tested. If the pattern continues, out goes the batch.

Dies . . . Yale & Towne developed a radical type of lock for exterior doors, installable merely by drilling two holes. To get requisite operating requirements with low sales price, the whole lock was designed from die castings and stampings. In this issue, the lock and the special elements of the die-casting dies for it are described by Harold E. Nagle, general supt., Stamford Div. . . . In our next issue, he goes on to explain the forging dies.

Coming . . . In recognition of the forthcoming Materials Handling Show in Cleveland, Jan. 10-14, *A.M.* for Dec. 30 has a preponderance of articles on that subject . . . The Special Report deals with the effect of materials handling on shop layout, including typical examples of plants laid out for economical materials flow . . . Two articles describe materials handling tricks at the new Hotpoint range plant and use of a carrousel assembly conveyor in making a bottle dispenser at Jacobs Mfg. Co. . . . In addition there'll be a list of exhibitors at the Show and a Show-in-Print preview of the new equipment to be exhibited . . . Other articles discuss forming dies, stress-relieving of welds, a safety program run by employees, and a special foundation network for presses.

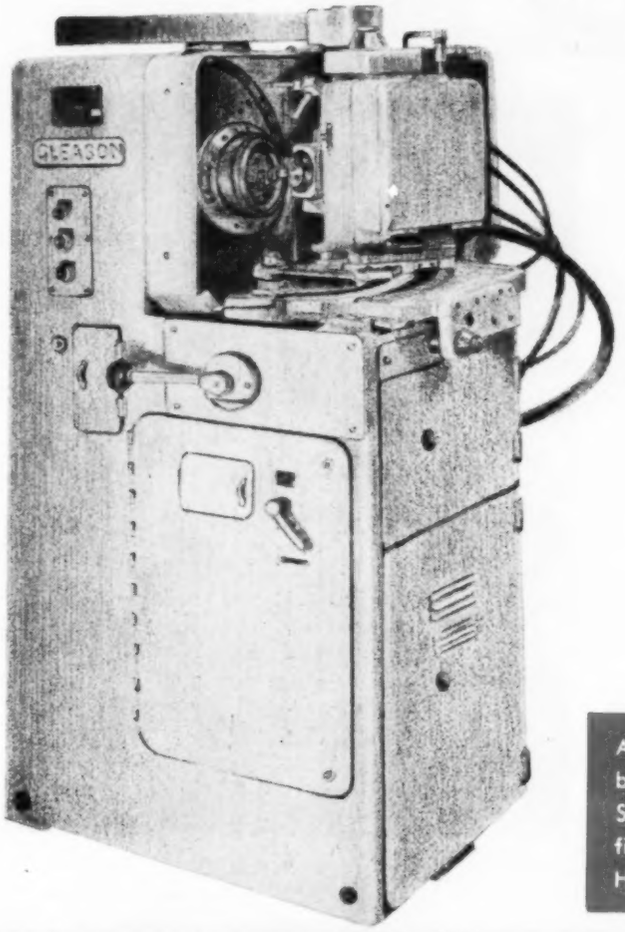
CONTROLLER . . . Jack L. Shafer, superintendent of inspection for Jack & Heintz Precision Industries, Cleveland, received his background in quality control under the auspices of G. D. Edwards, director of quality assurance for Bell Laboratories. He was director of quality control for Cleveland Ordnance District. Entering the Navy in 1943, he greatly assisted the Bureau of Ordnance in establishing its quality-control program.

Prior to his work at Jack & Heintz, Mr. Shafer acted in a consulting capacity on quality problems. Having established a reputation as an informative lecturer on Quality Control, he has taught the subject in various schools as well as speaking at quality-control conferences. He provides the details of his company's inspection system herewith.

A GEAR CUTTING GENERATOR FOR THE SMALL BEVEL GEAR FIELD

GLEASON
No. 2 Hypoid Generator

SPIRAL BEVEL
ZEROL BEVEL
&
HYPOID GEARS



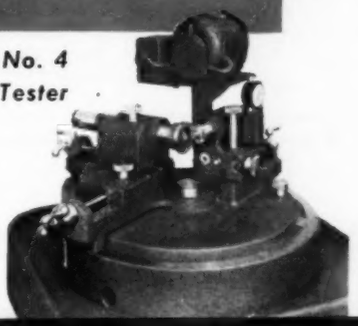
The latest addition to the small gear cutting field (for gears of 16 D.P. and finer) for production or jobbing is the new Gleason No. 2 Hypoid Generator. Closer control of actual cutting is provided on this machine, thereby making possible faster cutting time and a superior tooth bearing, accurately located. In most cases generated gears can be completed from the solid in one operation. In addition, this machine will produce curvic clutches and couplings and high reduction hypoid gears.

Additional equipment necessary to the smooth production of bevel gears and hypoids is the Gleason No. 7 Hypoid Cutter Sharpener which produces a high quality cutting edge and finish on the multi-blade circular cutters used on the No. 2 Hypoid Generators.

Gleason No. 7
Hypoid Cutter Sharpener

The No. 4 Angular Bevel Tester is employed to check the rolling qualities, tooth spacing and concentricity of small fine pitch bevel gears such as those cut on the No. 2 Hypoid Generator.

Gleason No. 4
Angular Bevel Tester



GLEASON *Works*
1000 University Avenue
Rochester 3, N.Y., U.S.A.

Builders of Bevel Gear Machinery for Over Eighty Years

Left: Dial Type Milling Machines have labor-aiding power speed and feed change. Built in Nos. 2, 3 and 4 sizes; medium and high speed ranges; plain, universal and vertical styles. Catalog M-1623-1.

Right: With one hand, and without walking or stretching, the entire range of speeds and feeds can be changed with this lever.

Talk to the man who runs one

The man at the machine has more influence on performance than you might think. Especially is this true of general-purpose machines like knee-and-column type millers, employed for comparatively short runs. ¶Take the simple chore of changing speeds and feeds, for example. From start to finish of some jobs, this can (or should) happen as often as: number of parts x 2 or more. Make it easy to do, and the operator will have no objection to doing it. Make it difficult or out of reach, and efficient cutting practice usually fares badly. ¶Recognizing the operator's influence on shop costs, Cincinnati has incorporated two big features of easy operation in all their Dial Type milling machines.

1) Power selection and changing of spindle speeds

2) Power selection and changing of feeds

Talk to the man who runs a Dial Type. He'll tell you that Dial Type ease of operation is tops with him. And that makes them tops in reducing the cost of milling operations.

Left: High Power and Dual Power Dial Type Milling Machines have labor-aiding power speed and feed change. Built in Nos. 3, 4, 5 and 6 sizes; plain and vertical styles (also universal style for Nos. 3 and 4). Catalog M-1644 for High Power Dial Types; M-1647 for Dual Power Dial Types.

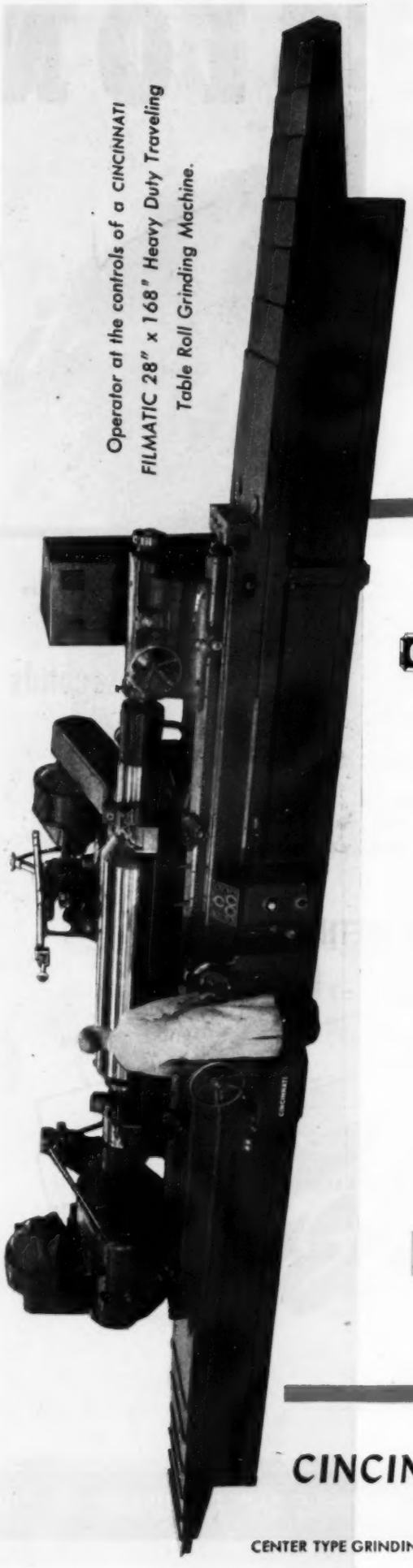
Right: With one hand, and without walking or stretching, the entire range of speeds and feeds can be changed with this lever.

CINCINNATI

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID



Operator at the controls of a CINCINNATI FILMATIC 28" x 168" Heavy Duty Traveling Table Roll Grinding Machine.

NEW CINCINNATI FILMATIC

ROLL GRINDING MACHINES

20", 24", 28" HEAVY DUTY TRAVELING TABLE

CINCINNATI

• Years from today, roll shopmen will refer to these new CINCINNATI FILMATIC Roll Grinders as "Old Faithful." And with good reason, too. They're constructed to give top performance without ever quitting or requiring extra attention because conditions aren't just right.

Two of many features . . .

FILMATIC grinding wheel spindle bearings, and circulating, filtered lubricating system for the ways, with electrical pressure switch protection . . . develop the machine's reliability factor to a very high degree.

Two more features you can't afford to overlook:

Automatic wheel balancing, and Electronic table traverse.

They pay off in time saved and improved finish.

FILMATIC

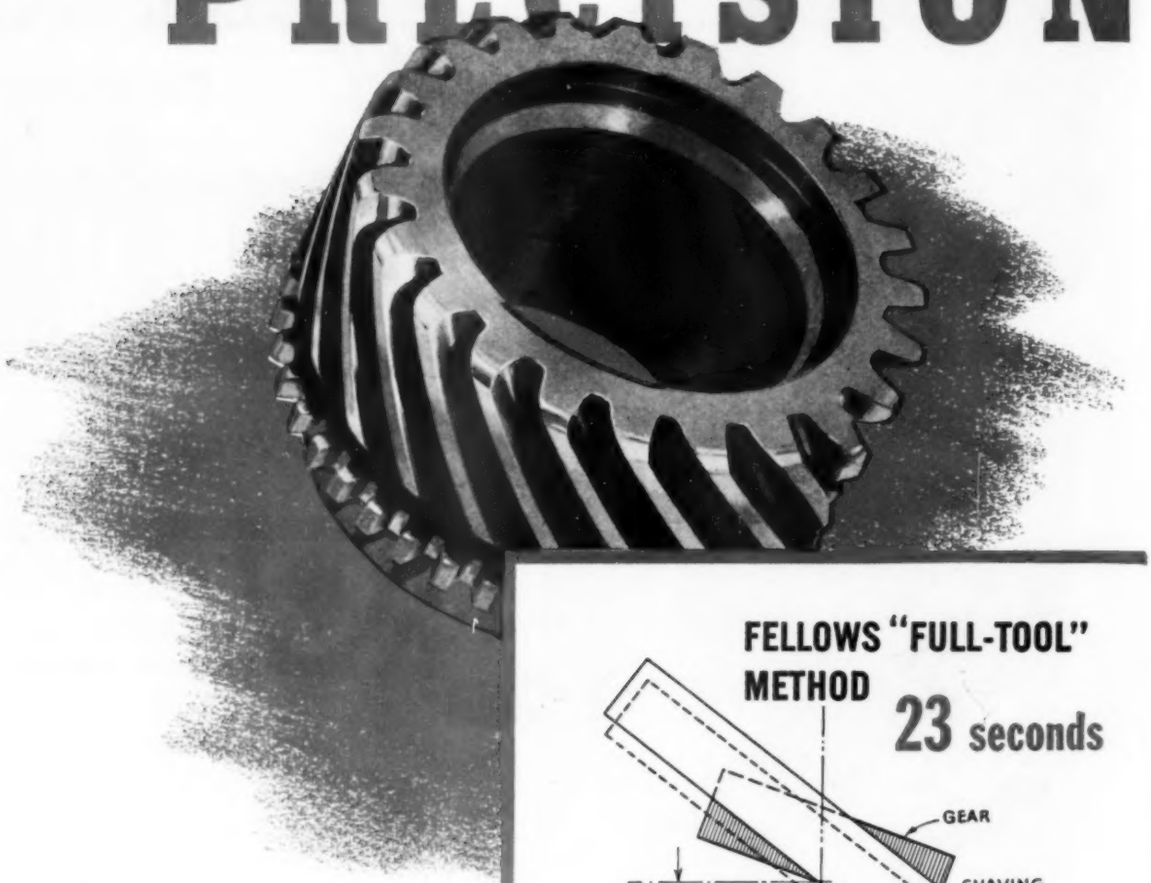
A new catalog, G-587, just off the press contains complete details and specifications on these new CINCINNATI 20", 24" and 28" Heavy Duty Traveling Table Roll Grinding Machines. Write for your copy of this catalog today.

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES

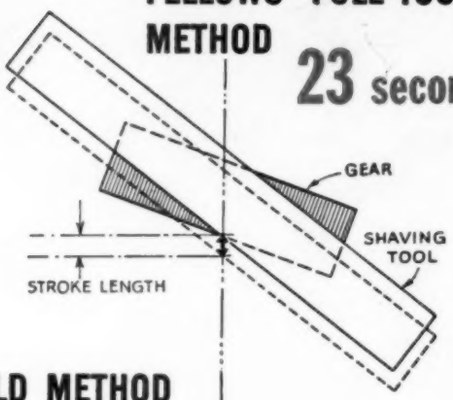
PRECISION



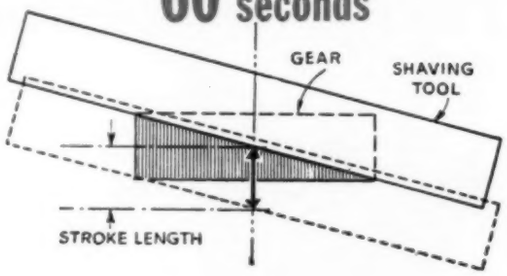
GEAR SPECIFICATIONS

Material (Steel Forging)	S.A.E. 1024
No. of teeth	23
Normal pitch	10
Normal pressure angle	14°
Helix angle	42° 36′ 30″
Face width	1″
Lead Limit	.0002″
Involute Limit	±.0004″

FELLOWS "FULL-TOOL" METHOD **23 seconds**



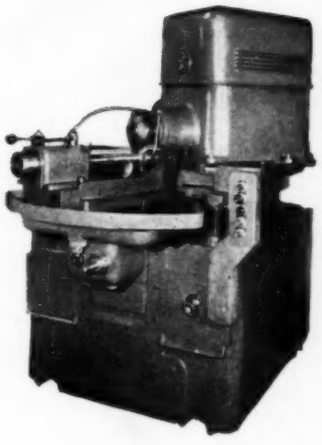
OLD METHOD **60 seconds**



GEAR SHAPERS · THREAD GENERATORS · CUTTERS · SHAVING AND BURNISHING MACHINES

FINISHED

in 23 seconds



Fellows "Full-Tool" Shaving More Than Doubles Output ...Prolongs Tool Life

Shaving as a finishing process can now play an important role in low-cost mass production. The Fellows "Full-Tool" method permits a shorter stroke, provides freer cutting and higher reciprocating speeds and consequent greater output. Cutting action is so distributed as to obtain an even finer tooth finish with less wear on the shaving tool.

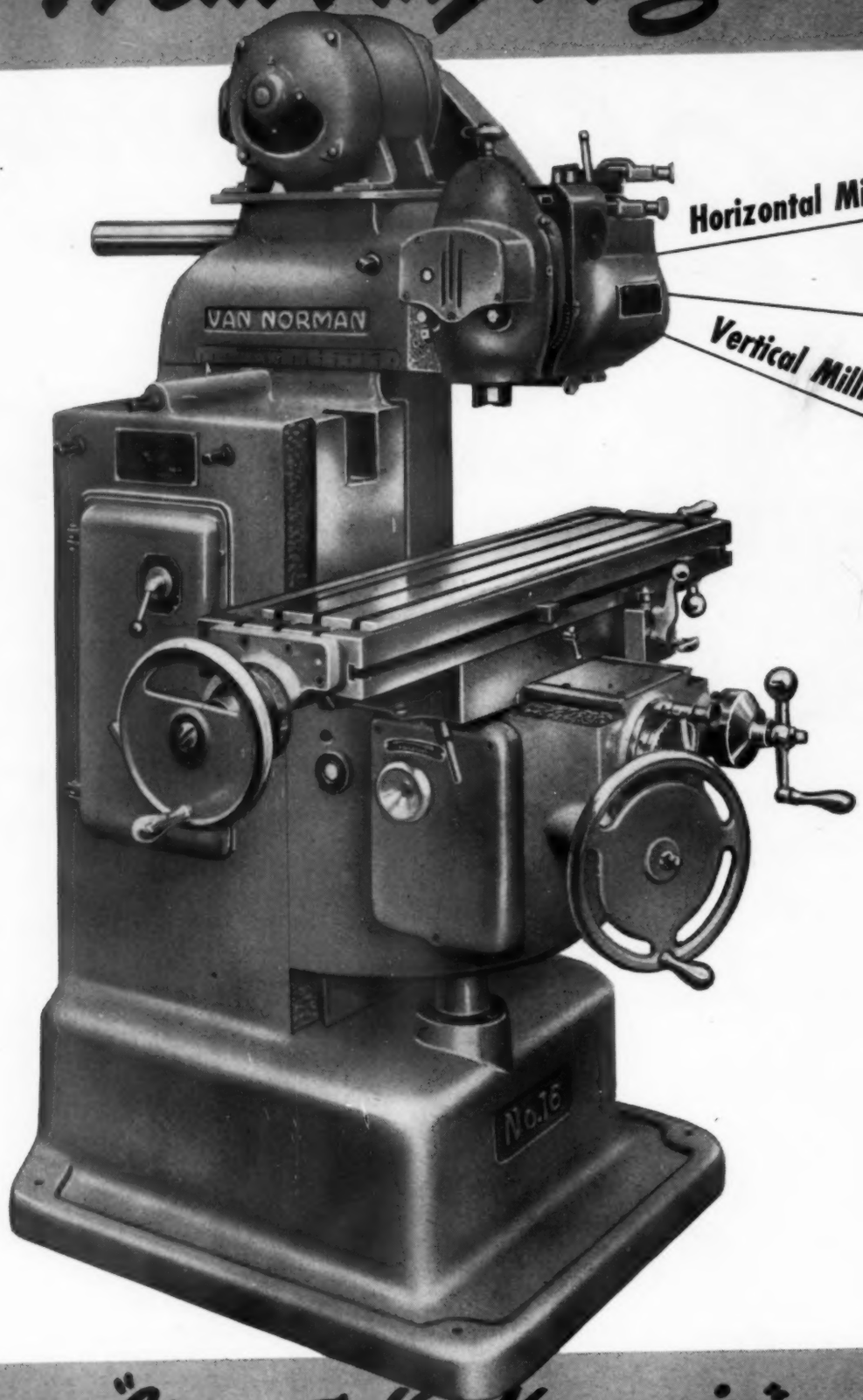
Every production-minded manufacturer will want to know more about this new method of low cost gear finishing. For more complete information, write for the latest bulletin on the Fellows Method of "Full-Tool" shaving. Simply contact our nearest office.

Fellows

THE FELLOWS GEAR SHAPER COMPANY
Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2. 640 West Town Office Bldg., Chicago 12. 7706 Empire State Bldg., New York 1.

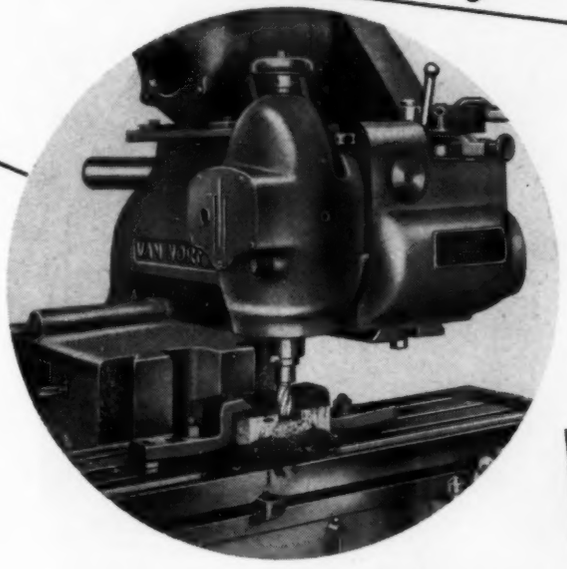
GEAR MEASURING AND INSPECTION INSTRUMENTS · PLASTICS MOLDING MACHINES

From Any Angle . . .



"It pays to Van Normanize"

Angular Milling



VAN NORMAN

NO. 16 RAM TYPE MILLING MACHINES INCREASE PRODUCTIVITY

This Van Norman No. 16 Miller gives you many outstanding and exclusive advantages that assure more workability for your plant.

The adjustable cutterhead, which permits vertical, horizontal or angular milling on one machine, cuts idle machine time by as much as 50%. The moveable ram plus the saddle cross feed increases the work range and capacity of the miller . . . enables you to handle larger work pieces with ease. Single lever built-in electrical control simplifies operation. Spindle speeds from 95 to 2,000 rpm give you the right speed for every type of cut. Add such construction features as hardened alloy steel gears, large hardened alloy steel multi-splined shafts, precision-ground feed screws, one-shot metered lubrication and you have a milling machine that provides greatest productivity, lowest cost milling and long operating life.

Write for bulletin, today

VAN NORMAN COMPANY

Springfield 7, Massachusetts

AUTOMOTIVE LANDIS

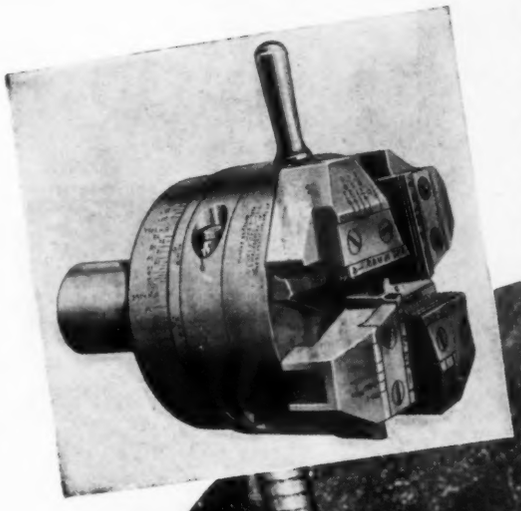
Packard Motor Car Company—Hardened and Ground LANCO Head on LANDMACO Leadscrew Precision Threading Machine cutting a 1" 14 pitch thread 3/8" long on end of a main shaft. Output—150 per hour, floor-to-floor.

The LANDIS Machine

WAYNESBORO · PENNSYLVANIA

PARTS *threaded by* DIE HEADS...

Packard and Kaiser-Frazer are two of the many automobile manufacturers using Landis Die Heads to produce threads on automobile parts. In the mass production of parts to be used in a continuous line final assembly, accuracy is as important as high output. Landis Die Heads consistently have been high production tools on a wide variety of operations. At the same time they produce threads to meet the most rigid specifications. The virtual elimination of "down time" on Landis Die Heads is another feature that makes them well adapted to mass production operations. For information, write for Bulletins F-80 & F-90.



Kaiser-Frazer, Willow Run Plant—5/8" F Type LANDMATIC Head cutting a 5/8" 18 pitch National Fine thread 1/2" long on a steering worm end. Output—100 per hour, floor-to-floor.

CO.

U. S. A.

EQUIPPED WITH MICROSPHERE BEARINGS

4" x 12" Landis Tool Type H Plain Hydraulic Grinder. Catalog A44

Electric Shavers Ground to

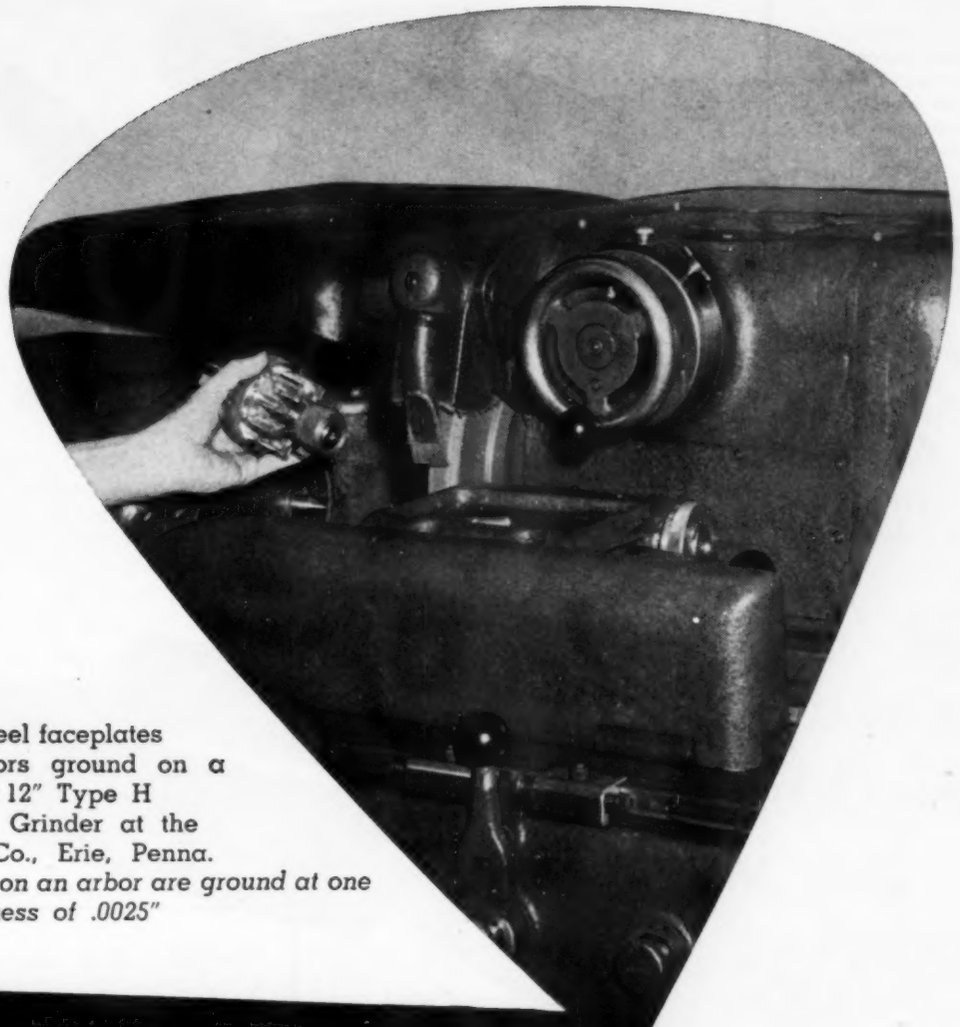
standard features

- Microsphere Wheel Spindle Bearings
- All Controls Convenient for Operator
- Hydraulic Work Traverse
- Headstock Driven by Adjustable Speed Motor
- Hydraulic Automatic Wheel Feed

extra equipment

- Hydraulic Timer
- Hydraulic Straight Infeed
- Visual Automatic Sizing
- Hydraulic Operated Footstock
- Wheel Reciprocating Mechanism

LANDIS TOOL
Precision Grinders

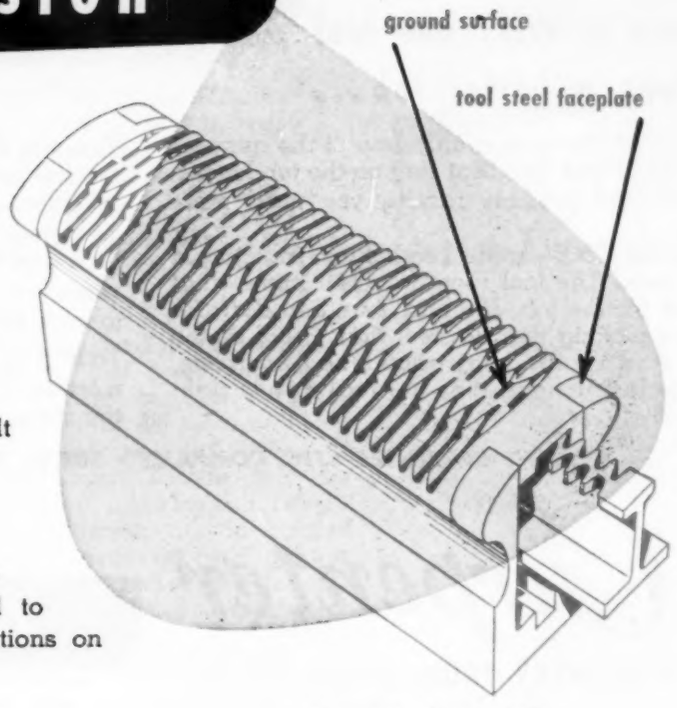


Hardened tool steel faceplates for electric razors ground on a Landis Tool 4" x 12" Type H Plain Hydraulic Grinder at the Collman Mfg. Co., Erie, Penna. *Eight faceplates on an arbor are ground at one time to a thickness of .0025"*

Hairline Precision

If you need production quantities of precision ground small parts, the Landis Tool 4" Type H Plain Hydraulic Grinder gives you a low cost answer. The Microsphere Bearing equipped wheel spindle gives fine finishes and accurate size. It permits a micrometer setting of bearing clearance to the smallest figure on any grinding machine. The result is a more sensitive feed and faster spark-out.

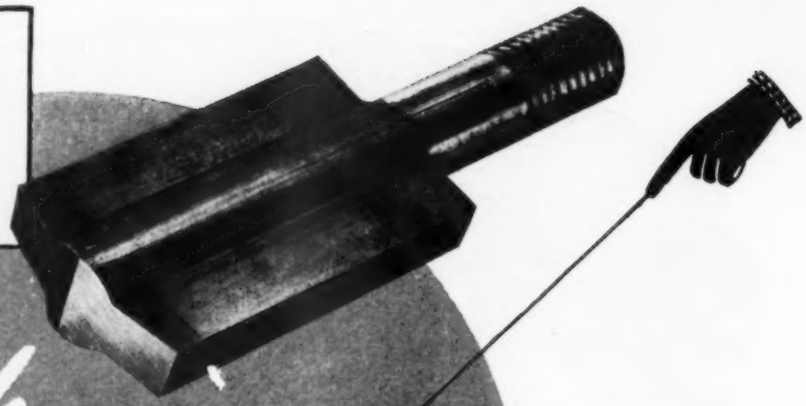
For special production needs, available extra equipment provides a ready made answer at low cost. If you have a precision grinding problem, our engineers will be pleased to give production estimates and tooling suggestions on the basis of blueprints.



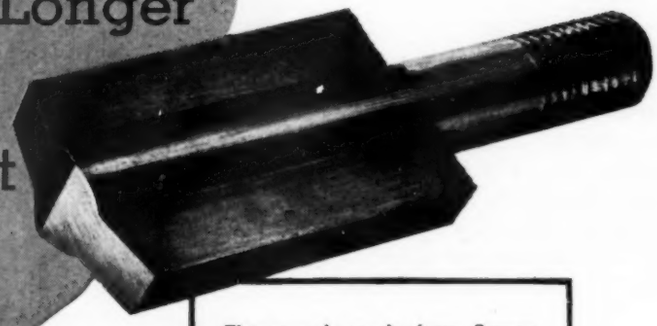
Shaver Head Assembly

LANDIS TOOL COMPANY, 10 E. SIXTH ST., WAYNESBORO, PA.

This tool for punching 3/16" thick O.H. steel sheet was made from a tool steel that promised to provide the *toughness* needed on the job. But excessive wear meant that the punch had to be reground after 190,000 holes had been punched.



Which
OF THESE TWO TOOLS
Will Stay On The Job Longer and Increase Machine Output Per Month?



This punch made from *Stentor* tool steel provided just the right combination of toughness and wear resistance for the job. With it, production jumped over 100% —to 387,000 holes between grinds!

here is WHY one tool does a better job...

Good tool and die steel is only *one* of the answers to getting tools and dies that stay on the job longer. But to get best possible results, you need more than that.

A tool giving 100% more production isn't just a stroke of luck! The tool room foreman knew what he needed for the job. He had found a *definite system* for picking the one steel that would do the job best. And as the heat treater had complete, easy-to-use instructions, they got real results right off the bat!

You can do the very same thing, by simply following the steps on the opposite page. Carpenter can give you a *definite system* for quickly finding the right tool and die steel for each job. You'll save time and have fewer tools and dies to make. And when you put Carpenter's heat treating information to work on your jobs, watch the headaches disappear.

To find the road that leads to better tools and dies, more output from each machine and press, follow the steps on the opposite page.

THE CARPENTER STEEL COMPANY • 109 W. Bern St., Reading, Pa.

Carpenter

Now Painted FULL LENGTH for Quick, Positive Identification

MATCHED

TOOL & DIE STEELS

IMMEDIATE DELIVERY FROM LOCAL STOCKS!

Atlanta • Baltimore • Birmingham, Ala. • Boston • Bridgeport, Conn. • Buffalo • Chicago • Cincinnati • Cleveland • Dayton • Detroit • Grand Rapids, Mich. • Hartford • Houston • Indianapolis • Kansas City • Los Angeles • New York • Philadelphia • Providence • St. Louis • Worcester, Mass. • *In Canada:* Toronto • Montreal

Export Department, 233 Broadway, New York 7, N. Y. "CARSTEELCO"

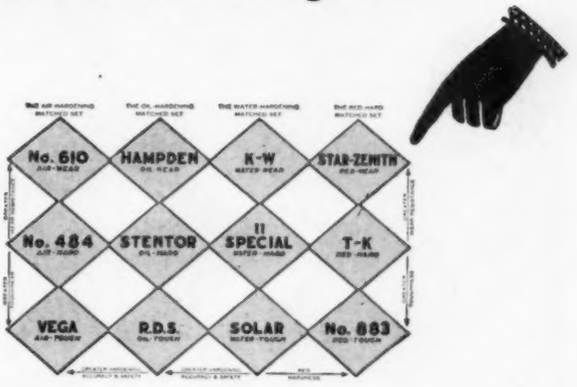
Follow these steps
TO LONGER TOOL AND DIE LIFE, LOWER TOOLING COSTS!

1 *Get acquainted* with the Matched Set Diagram

It actually points to the steel with the exact properties you need for almost every type of job in your tool room!

For example, it pays to start with the key steel, *No. 11 Special* (water-hard) straight carbon, tough timbre tool steel. However, when you want greater *wear resistance*, you travel *North* on the diagram. For *greater toughness* you go *South*. For *red-hardness*, go *East*, and for *greater hardening accuracy* and *safety*, the diagram points *West*.

Each of the Matched Tool and Die Steels on the diagram picks up its job where another leaves off. So you know in advance just what results to expect.

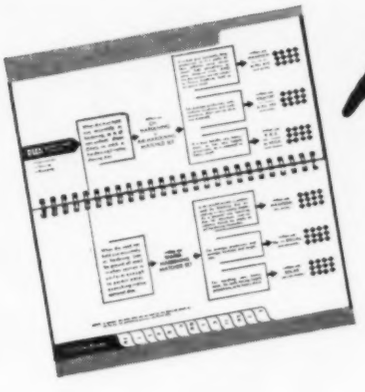


2 *Put this easy-to-use* Tool Steel Selector *to work*

It carries the *Matched Set Diagram* one step further.

In addition to helping you get the most from the diagram, the Matched Tool Steel Manual contains an 80-page *Tool Index and Steel Selector*. Just flick the indexed pages to find the tool steel recommended for any one of hundreds of types of tools and dies! And the *Carpenter Matched Tool Steel Manual* helps you in other ways, too. It gives complete, simplified heat treating instructions that will help you to get maximum performance from your tools and dies.

For your free copy of the *Matched Tool Steel Manual* containing the easy-to-use *Tool Steel Selector*, write us on your company letterhead, indicating your title.



3 *Cash-in on these* Cost-Reducing Developments

Good design, skilled tool making, and accurate heat treating are often wasted on tool steel that isn't manufactured under strict quality controls. To make sure you get only clean, internally sound steel, Carpenter took the lead in guaranteeing 100% acid disc inspection. Then the Tough Timbre Test (for wider, safe hardening range) . . . Torsion Impact Test (to eliminate guesswork in hardening) . . . and the Cone Test (to check and control hardenability) were developed to help you improve tool and die performance.

To cash-in on all these cost-reducing advantages, put Carpenter Matched Tool and Die Steels to work, now. For prompt delivery from complete stocks, call Carpenter, today.

Self-aligning, free-rolling action

E ffective seals keep grease in, dirt out

R adial-Thrust load capacity is high

Various mountings for all applications

In stock at all industrial centers

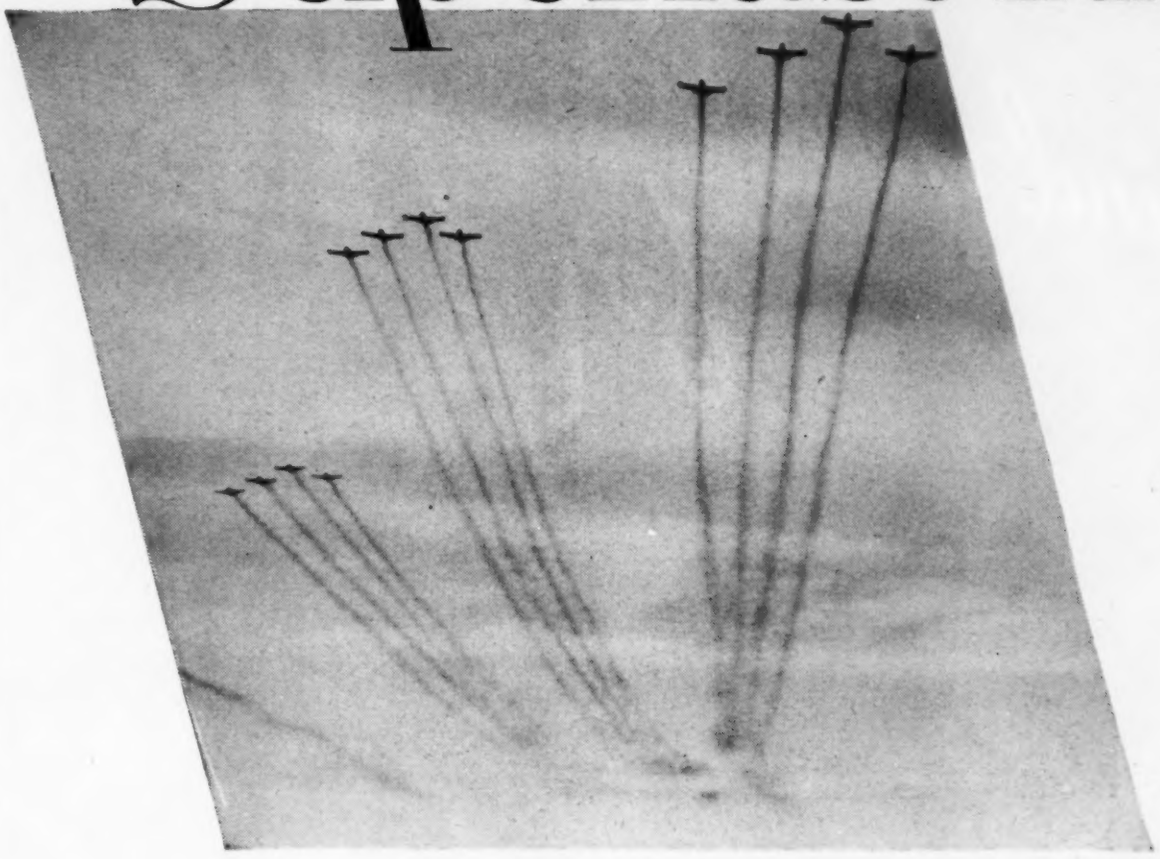
Compact, sturdy housings require minimum space

Economical, efficient and dependable operation

LINK-BELT COMPANY Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities. 11,308

LINK-BELT *Ball and Roller BEARINGS*

Superfast in the air...



but what about production?

An outstanding example of Bliss' pioneering in equipment for the aircraft industry is the patented 2500-ton Six Die Slide Press used by many aircraft builders to produce a variety of sheet metal parts. Dozens of dies are kept in constant operation, as 24 operators simply load and unload. Interlocked control of any slide sequence is provided. No master operator needed.

Planning for planes? Or for any giant production job? Then Bliss engineers can help. They'll dare to pioneer with you in designing power press equipment specially suited for the job at hand. They bring to every conference table a fund of *production* engineering knowledge that goes back over 90 years. They've designed and built more types and sizes of presses than any other company in the world.

Yes, if it's airplane wings or jet tail cones, gage parts or landing gear, Bliss is particularly qualified to bring to your pressed metal problem the development engineering experience that's needed to get the most out of production. That's why Bliss presses predominate throughout the pressed metal field, the aircraft, automotive, railroad, electrical, and many other industries... that's why the biggest presses for the toughest jobs have always been Bliss-built...that's why if yours is a tough one, you'll be on your way toward solving it by sending for a Bliss engineer today.

E. W. BLISS COMPANY, DETROIT 2, MICHIGAN

WORKS AT: Toledo, Cleveland, Salem, Ohio; Hastings, Mich.; Englewood, N. J.; Derby, England; St. Ouen sur Seine, France.

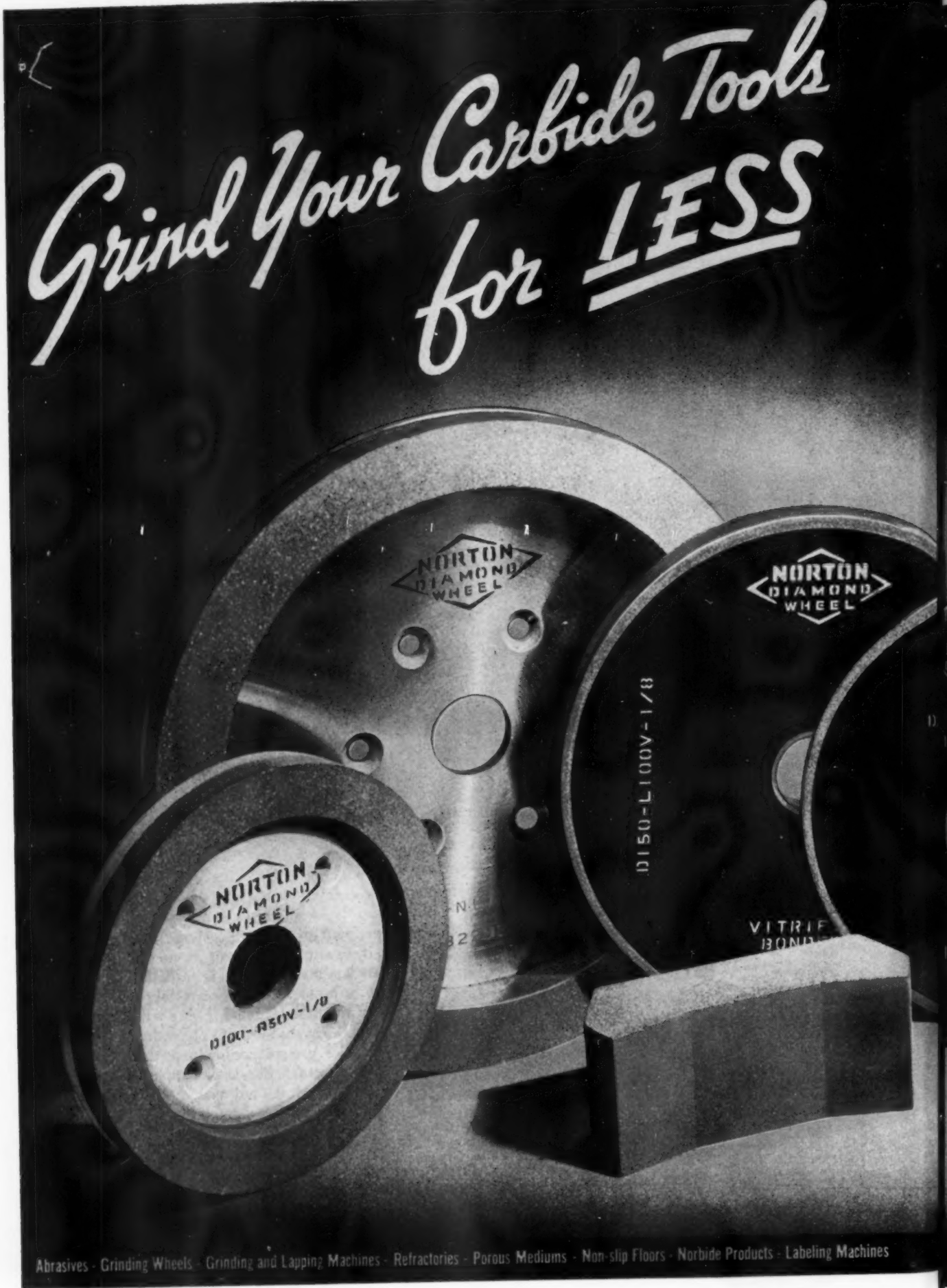
MARQUETTE · BLISS · CONSOLIDATED · TOLEDO ·

BLISS BUILT

See Our Catalog in SWEETS

BLISS BUILDS MORE TYPES AND SIZES OF PRESSES THAN ANY OTHER COMPANY IN THE WORLD

Grind Your Carbide Tools for LESS



Abrasives - Grinding Wheels - Grinding and Lapping Machines - Refractories - Porous Mediums - Non-slip Floors - Norbide Products - Labeling Machines

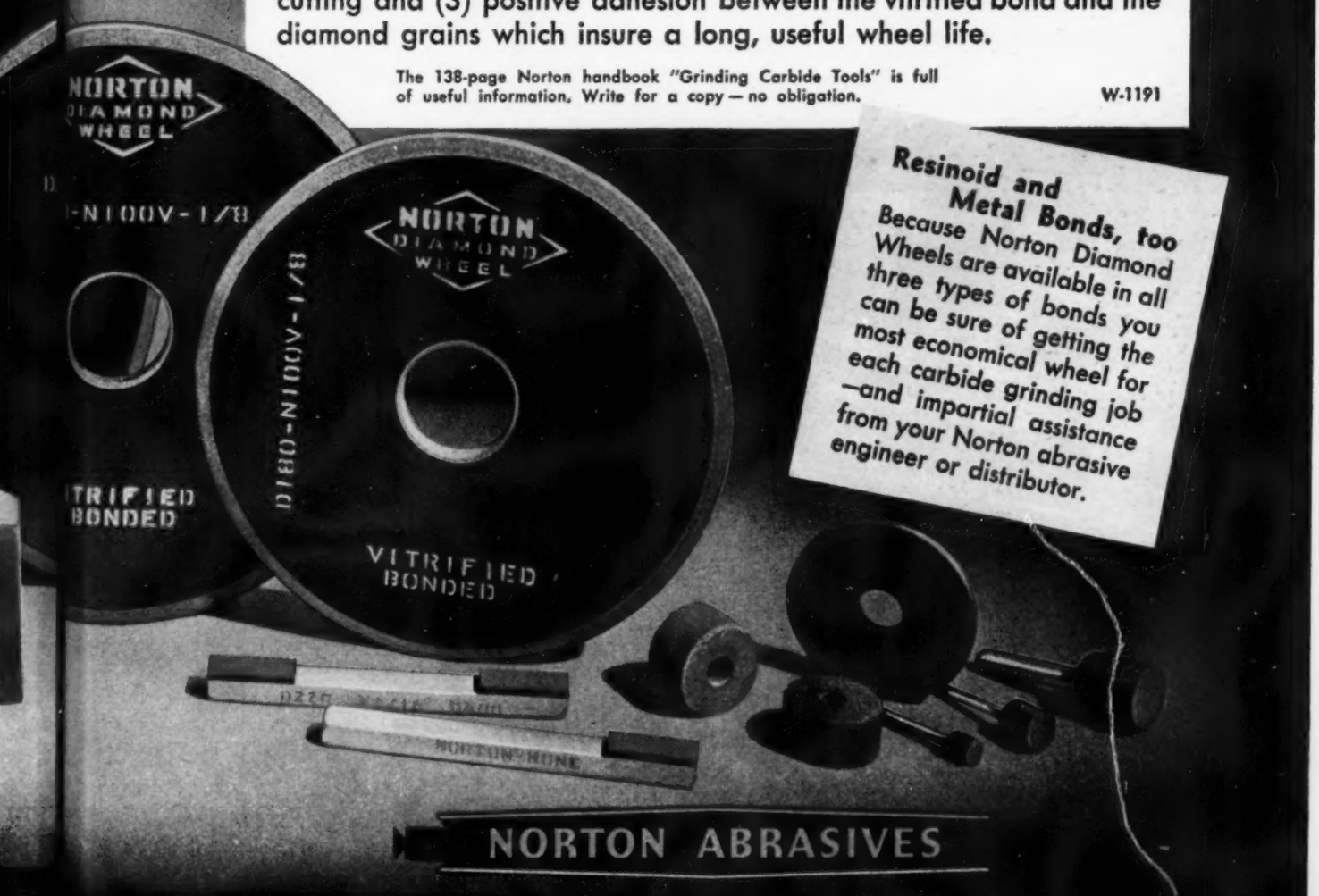
with NORTON *Vitrified Bonded* DIAMOND WHEELS

A fast cutting action *plus* long life — that's what you get with the Norton *Vitrified bonded* diamond wheel — that's why this patented Norton development will enable you to cut costs on many of your carbide tool and die grinding jobs.

For the offhand grinding of single point tools, for the grinding of chip breakers (wheels 1/4" and wider), and for many internal, cylindrical and surfacing jobs you'll find that Norton Vitrified diamond wheels can really cut costs.

Why? Because the vitrified type of bond, used so widely in other Norton wheels, gives a diamond wheel with these outstanding features: (1) a rigidity that gives dimensional accuracy to the work being ground, (2) a porous structure to promote faster and cooler cutting and (3) positive adhesion between the vitrified bond and the diamond grains which insure a long, useful wheel life.

The 138-page Norton handbook "Grinding Carbide Tools" is full of useful information. Write for a copy — no obligation. W-1191



Resinoid and Metal Bonds, too

Because Norton Diamond Wheels are available in all three types of bonds you can be sure of getting the most economical wheel for each carbide grinding job —and impartial assistance from your Norton abrasive engineer or distributor.

NORTON ABRASIVES

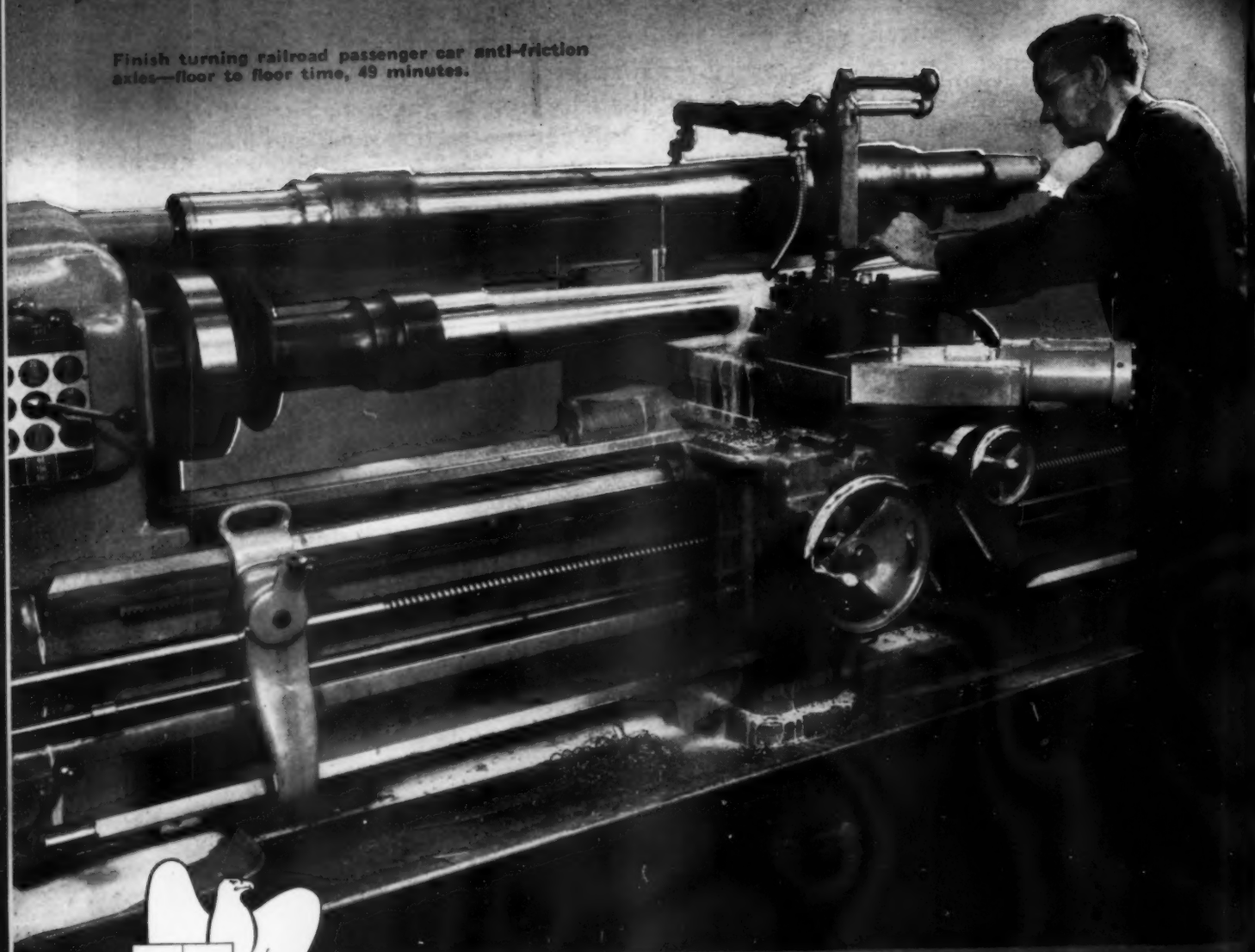
NORTON COMPANY, WORCESTER, MASS., New York, Chicago, Detroit, Cleveland, Philadelphia, Pittsburgh, Hartford, Denver, Los Angeles

Production Costs hit a new low—

The "American" Hydraulic Shaft Duplicator introduces a new technique in shaft turning that has revolutionized the art. It is a thoroughly engineered development for reproducing work shapes from a template by means of a hydraulically controlled cutting tool. The template holder and tracer head are built-in at the rear of the lathe where they will not obstruct the operator's vision of the work or interfere with loading and unloading. All operating controls are located at the front of the lathe.

It is faithful and accurate in its reproduction.

Finish turning railroad passenger car anti-friction axles—floor to floor time, 49 minutes.



THE AMERICAN TOOL WORKS CO.

Rough and finish turning motor shafts 42½" long from 3¾" bar stock in floor to floor time of 39 minutes.

...THE LATEST *Cost Cutting* SENSATION!

Reductions of 75% are not uncommon.
Reductions of 50% are average.

It will reproduce steps, tapers, right angle and tapered shoulders, recesses, grinding necks and radii and is especially adapted to the production of such work as spindles, motor shafts, valve stems, back shafts, piston rods, axles . . . in fact any shaft having an irregular contour.

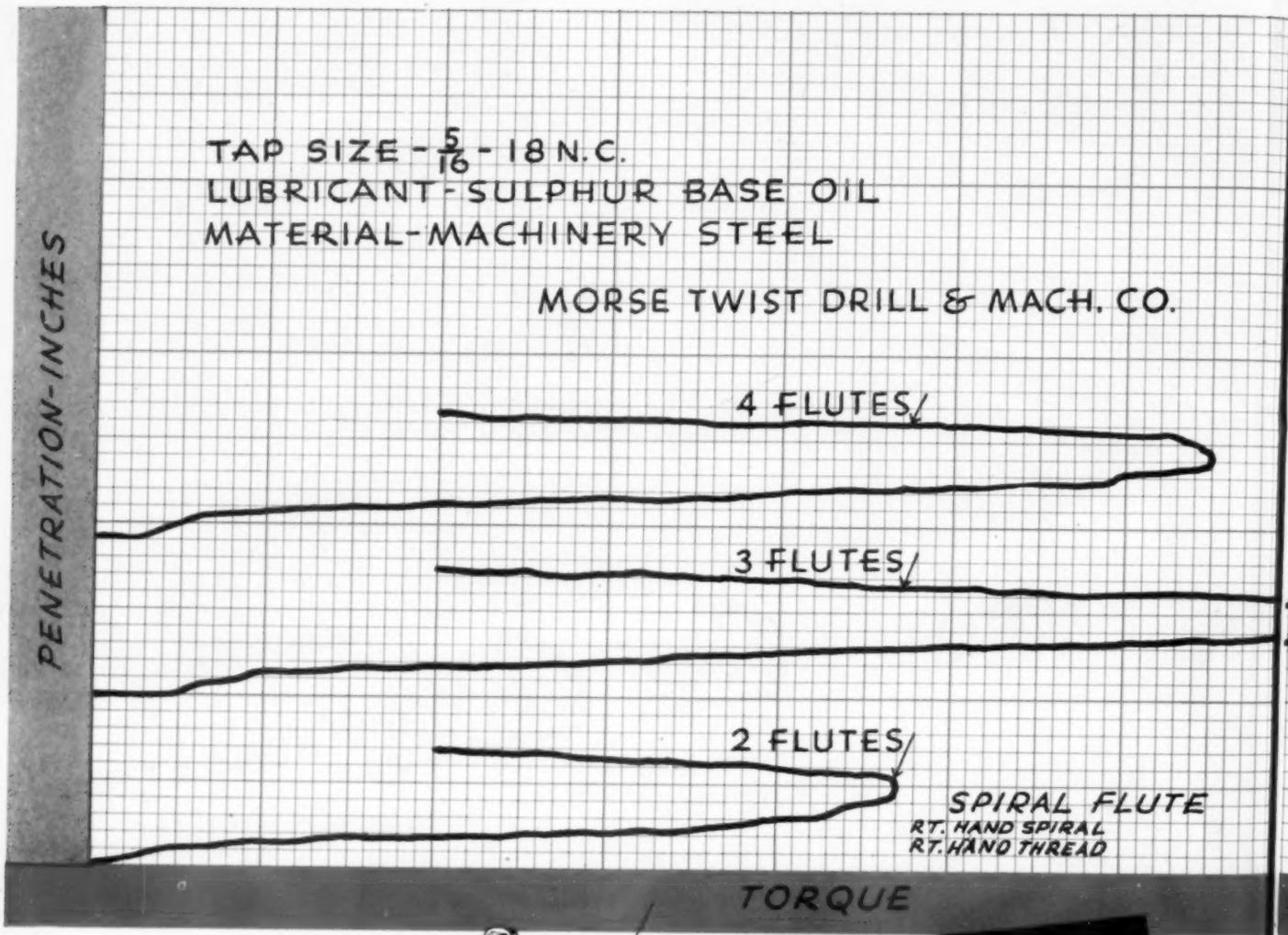
A single hydraulic system is employed for operating the hydraulic tracer valve and the piston which controls the movement of the tool slide carrying the cutting tool. This simplicity is an outstanding feature and insures accurate reproduction, freedom from failures and elimination of work rejects. This new metal cutting technique permits continuous cutting without interruption for measuring or calipering at feeds and speeds to the cutting limit of Cemented Carbide tools. "Miking" is confined to the first diameter only after which all other diameters are secured automatically.

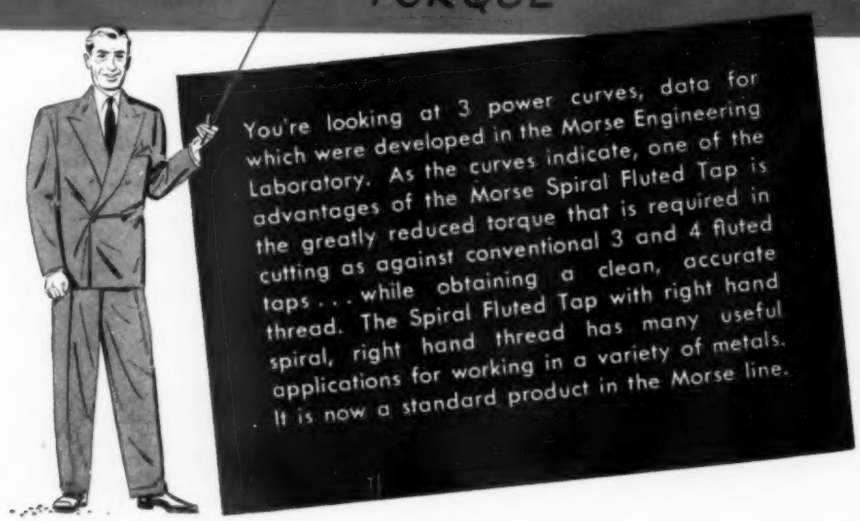
This machine may be quickly converted to standard lathe operations.

Descriptive Bulletin No. 35 sent upon request.

Cincinnati, Ohio U.S.A. LATHES AND RADIAL DRILLS

Because MORSE




You're looking at 3 power curves, data for which were developed in the Morse Engineering Laboratory. As the curves indicate, one of the advantages of the Morse Spiral Fluted Tap is the greatly reduced torque that is required in cutting as against conventional 3 and 4 fluted taps . . . while obtaining a clean, accurate thread. The Spiral Fluted Tap with right hand spiral, right hand thread has many useful applications for working in a variety of metals. It is now a standard product in the Morse line.

SPIRAL FLUTED TAPS

have the RIGHT "TOUCH"

. . . they produce the Right Thread in Many Tricky Metals!

Here's a story of tap "evolution" that can pay off on *your* jobs! *Originally* designed for aluminum, the Morse Spiral Fluted Tap next proved its worth in magnesium, zinc, copper and brass . . . and now it's producing clean, smooth threads in soft steels as well! In metals such as these where ordinary taps can cause torn, rough or damaged threads, the shear cut of the Morse Spiral Fluted Tap assures strong, accurate threads.

Due to the special design of the tap, less power is required, as is shown in the curve on the left — less breakage results and taps have longer life. You obtain "bonuses", too, in faster production resulting from higher permissible speeds . . . and in the free cutting action which automatically clears the chips from the hole.

This two-fluted tap with right hand spiral, right hand thread is a standard Morse product. Your Industrial Supply Distributor and Morse engineer can help you select the correct Morse standard or special tap that your production requirements demand for working in any metal.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

NEW BEDFORD, MASSACHUSETTS

A DIVISION OF VAN NORMAN COMPANY

New York Store: 130 Lafayette St. • Detroit Store: 2952 East Grand Blvd. • Chicago Store: 570 West Randolph St. • San Francisco Store: 1180 Folsom St.

A BUYING GUIDE FOR ABRASIVES

ABRASIVE PROBLEM:
How can proper selection and application be assured?

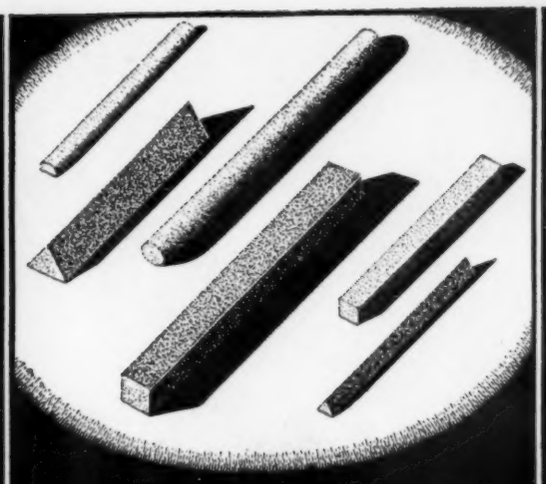
ANSWER BY
CARBORUNDUM
TRADE MARK

To realize maximum efficiency from even the highest quality abrasives, it is essential that attention be directed to their correct use. For this specific purpose, The Carborundum Company has established a specialized group of product application engineers.

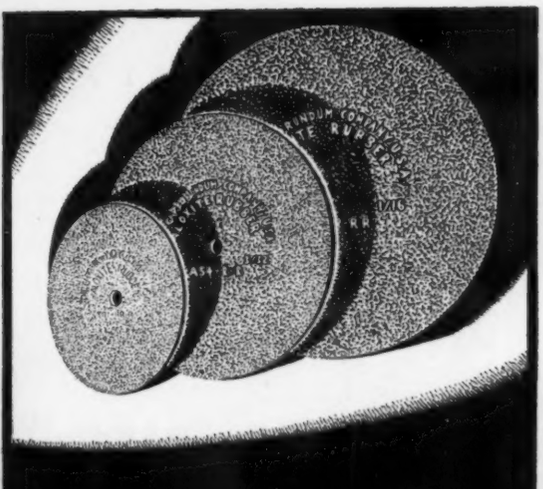
This group studies, appraises and tabulates abrasive applications. New improved methods and better abrasive products are often turned up. CARBORUNDUM engineers are also called in to help in selecting the best abrasives to use for specific jobs and in specifying their application. The end result is better grinding, sanding and finishing at lower overall cost... another reason pointed to in preferring abrasives by CARBORUNDUM. The Carborundum Company, Niagara Falls, New York.

"CARBORUNDUM" IS A REGISTERED TRADEMARK WHICH INDICATES MANUFACTURE BY THE CARBORUNDUM COMPANY

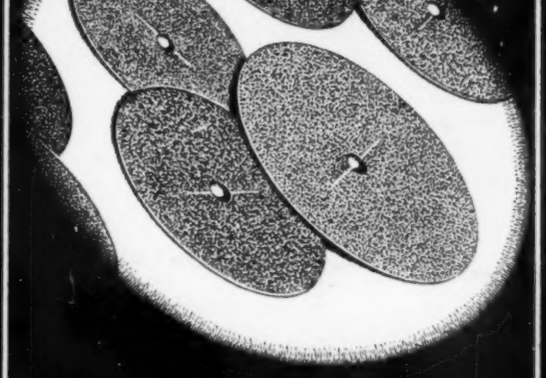
A Good Rule for Good Grinding



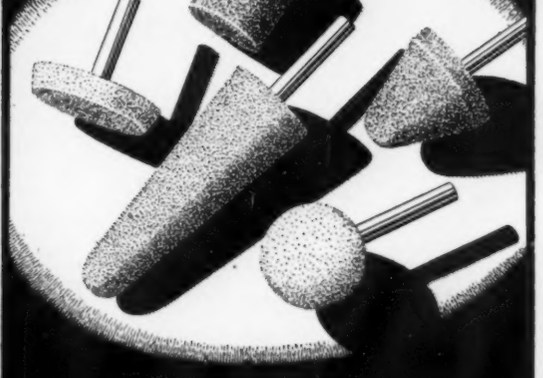
Tool Room sticks and stones that cut fast... last long... and hold their form.



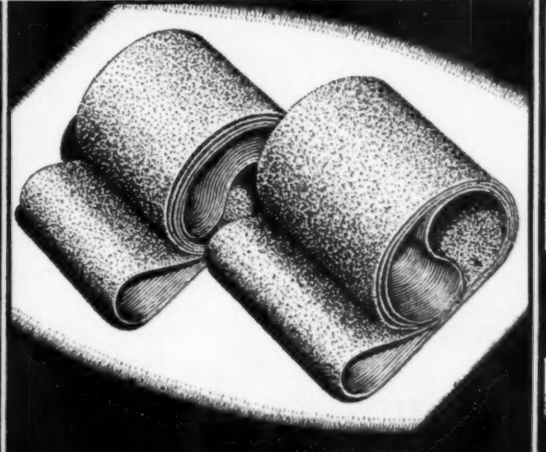
Cutting-Off Wheels... the modern tool for faster, less costly, more finished cuts.



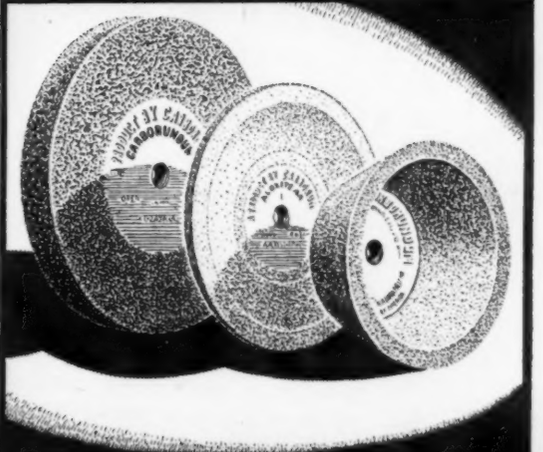
Long lasting Discs for both flat and curved surfaces.



Mounted wheels, in all standard grits and grades, for portable grinding equipment.



A Coated Abrasive for every sanding and finishing condition.



All standard shapes are supplied in grinding wheels by CARBORUNDUM.

... CALL IN CARBORUNDUM

TRADE MARK

● BONDED ABRASIVES ● COATED ABRASIVES ● ABRASIVE GRAINS AND COMPOUNDS

WINTER BROTHERS TAPS ARE DEPENDABLE

PRODUCT ENGINEERING *and* DEVELOPMENT

Winter Commercial Ground Thread Taps are typical of Winter dependability. They are form ground after hardening by an exclusive Winter process, and will work freely even on tough materials.

The design of Winter taps is based on two elements: laboratory testing and field testing. In the field, Winter taps are tested under actual production conditions. Reports of these tests are forwarded to the Winter laboratories. Here the information gained in the field is used to guide experiments in the development of better cutting tools. That is why when you specify Winter Taps you get taps which incorporate the latest advancements in metal cutting.

Always at Your Service

YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.

Winter Brothers COMPANY

ROCHESTER, MICH. and WRENTHAM, MASS. • Distributors in Principal Cities

A Division of the National Twist Drill and Tool Company • Branch Stores: San Francisco, Chicago, Detroit

PERFORMANCE IS BUILT INTO
NATIONAL METAL CUTTING TOOLS

MANUFACTURING FACILITIES

National Counterbores are available with or without pilots, and with taper shank or straight shank holders. National End Mills are available in a wide variety of sizes and types, including both double and single end.

● "Why is it that National tools last so much longer?" One reason, we believe, is that in our new plant at Rochester, Michigan, we have the most complete and up-to-date manufacturing facilities to be found anywhere. These facilities contribute to the performance built into National High Speed and Carbon Steel Twist Drills and Reamers, High Speed Steel Milling Cutters, End Mills, Hobs, Counterbores, and Special Tools.

Call Your Distributor

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL Cutting Tools. Call them for cutting tools or any other staple industrial product.

NATIONAL TWIST DRILL AND TOOL COMPANY

ROCHESTER, MICHIGAN, U. S. A. Tap and Die Division — Winter Bros. Co.

Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco

IMPROVED for higher operating efficiency . . . .

IMPROVEMENTS START HERE

NEW WHEEL SPINDLE FEATURES

- Choice of two styles of completely self-contained spindle units—
  Plain-Bearing with automatic compensation for wear or *Antifriction-Bearing* with sealed grease lubrication
- Simple V-belt spindle drive protected by guard. 3 wheel speeds, quickly obtainable
- Upright base graduated to 110 degrees each side of zero.
- Lever facilities swiveling upright
- Single bolt clamps spindle slide upright

BROWN &

....the NEW DESIGN No. 13 UNIVERSAL & TOOL GRINDING MACHINE

BETTER PERFORMANCE STARTS HERE

This general-purpose No. 13 Universal & Tool Grinding Machine embodies many outstanding refinements in design and construction . . . engineered to simplify its set-ups, increase its versatility and prolong its service life. Automatic lubrication now protects all major mechanisms and bearing surfaces. In addition, it has all the broad utility and flexibility of the previous model. With this *new design* No. 13, you can increase the efficiency of such toolroom operations as the grinding of small and medium sized cylindrical work, form grinding, sharpening milling cutters, reamers and similar tools and miscellaneous other types of work. *Capacity:* centers swing 8" in diam.; take 24" in length.

Checklist OF IMPROVEMENTS

- Improved Wheel Spindle and Headstock
- 6 table speeds from 7¾" to 100" a minute
- New "bumping" control knob for table adjustment
- 4 changes of work speeds
- Automatic lubrication
- Built-in electrical controls meet MTE standards

MOTOR-DRIVEN HEADSTOCK

- 4 work speeds for dead-center or revolving-spindle grinding.
- Headstock spindle mounted on preloaded antifriction bearings.
- Angular settings to 100° each side of zero.

NEW CORRELATION OF CONTROLS

- Related grouping of all control permits maximum output . . . minimum operator fatigue.
- 6 rates of table speeds . . . changed from front of machine. Table has individual (¼ H.P.) motor drive.
- Convenient start-stop lever for headstock spindle and power table movement — or headstock only.

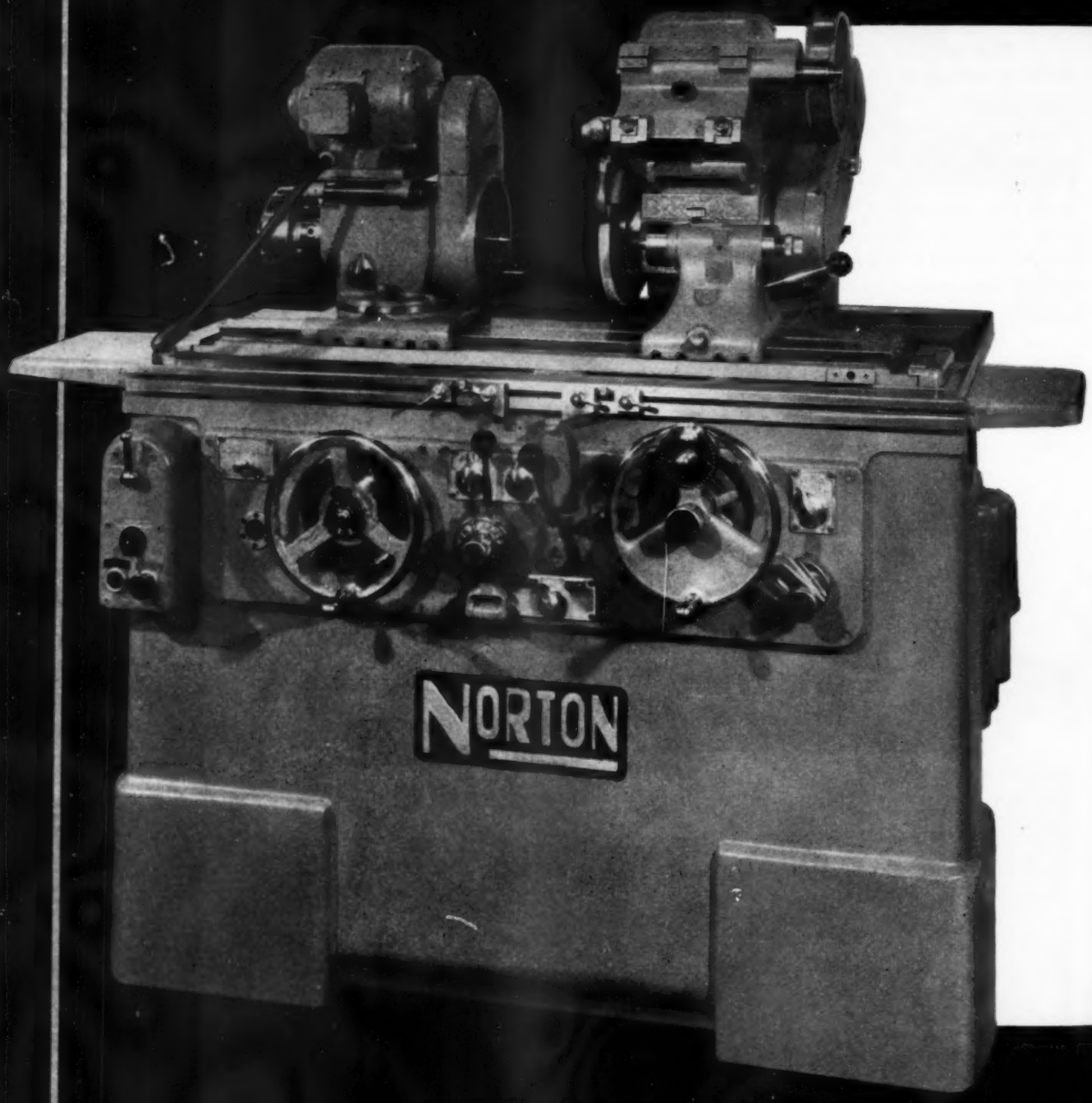
For complete specifications and descriptions of the new design No. 13, write Brown & Sharpe Mfg. Co., Providence 1, R.I., U. S. A.

SHARPE

B·S

Here's Why the new

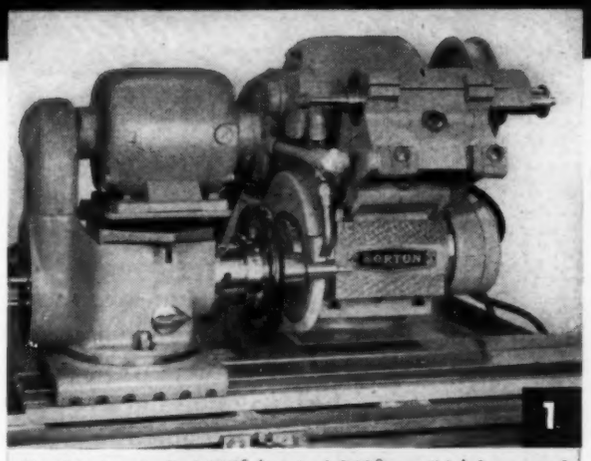
NORTON 10"×20" UNIVERSAL GRINDER



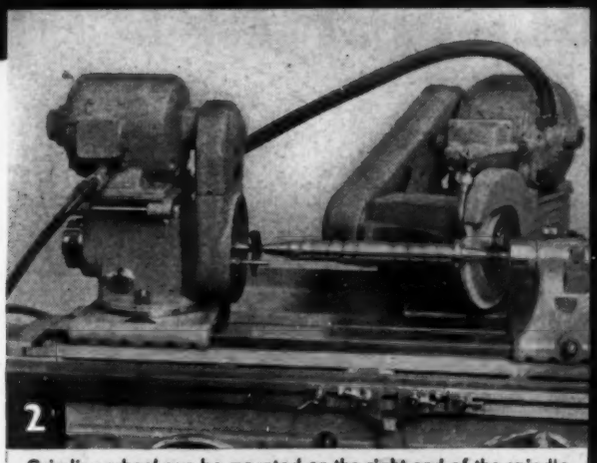
NORTON GRINDERS
and Lappers

Abrasives - Grinding Wheels - Grinding and Lapping Machines - Refractories - Porous Mediums - Non-slip Floors - Norbide Products - Labeling Machines

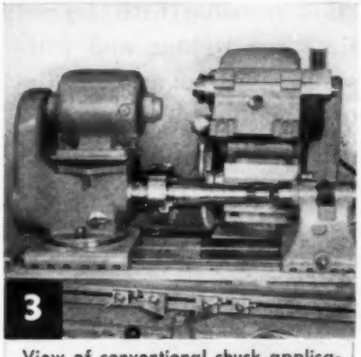
is a Handy, *Flexible* Machine *for the* TOOL ROOM *and* PRODUCTION WORK



Headstock swivelled 180° (total of 360° possible) for use of conventional or speed chucks. Note center and driver at other end for center type operations.



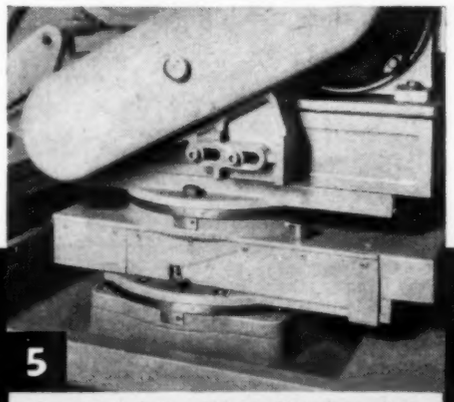
Grinding wheel can be mounted on the right end of the spindle whenever the nature of the job makes this either desirable or necessary. See other views for normal mounting.



View of conventional chuck application to standard cam lock nose on Headstock of Norton 10 x 20" Universal. Note how Internal Grinding Attachment locks in "Up" position.

1. **FLEXIBLE Double-end Headstock**
2. **FLEXIBLE Double-end Wheel Mount**
3. **FLEXIBLE Set-ups for Cylindrical Grinding**
4. **HANDY Internal Grinding Attachment hinged to front of Wheel Slide**
5. **FLEXIBLE Compound Swivel Wheel Slide**
6. **HANDY closely grouped controls**

Internal grinding with Norton 10 x 20" Universal. Note compact sturdiness of hinged type Internal Grinding Attachment which is quickly brought down into grinding position.



Compound Swivel Wheel Slide has additional amount of adjustment in upper portion of slide. Dovetail surface on front of wheel slide for special brackets.

This NEW, flexible NORTON Universal will bring economy to your jobs that require a multipurpose machine of this capacity. It is precise and dependable. Work speed changes from 50 to 500 r.p.m. by fingertip electronic control. Outstanding ease in handling makes it a "must" in tool room equipment programs.

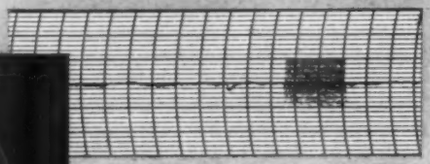
Close grouping fingertip positioning of operating controls makes operation fast and effortless.

NORTON COMPANY, WORCESTER 6, MASS · New York · Chicago · Detroit · Cleveland · Hartford · Distributors in All Principal Cities

PUT IT ON THE BLANCHARD

MAKE BETTER, LONGER-LASTING PARTS WITH FINER, FLATTER SURFACES

-Eliminate Lapping!



SURFACE FINISH CHART OF BLANCHARD-GROUND PIECE, USING BRUSH SURFACE ANALYZER WITH ATTENUATOR SET AT .01. SURFACE HAS ROUGHNESS VALUE OF ONLY 2 MICRO-INCHES.

3″ Valve Plate for Hydraulic Pump. Hardened Steel.

Checking flatness of Blanchard-ground surface with optical flat. Parallel lines show surface is flat within ½ light band. (5.8 millionths of an inch.)

Cast Iron End Plate for Refrigerator Compressor.

The optical flat shows this Blanchard-ground surface flat within ½ a light band.

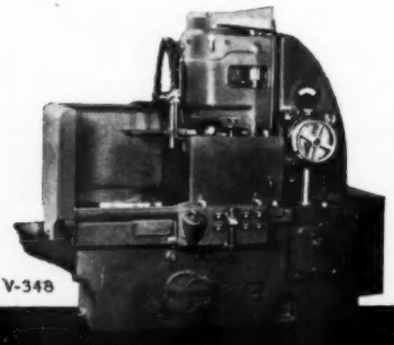
Checking flatness of production-lapped piece received from customer. Note the variation from flatness as shown by the curved lines.

Blanchard research has perfected a method of flat surface grinding—using only their standard Blanchard Grinders—whereby extremely fine finishes *and* extreme flatness can now be produced in *quantity production.* The illustrations show what is being accomplished. Lapping and all other subsequent finishing operations are eliminated.

Such Blanchard-ground parts show useful life increase of up to 5 times that possible with lapped parts. Joints are tighter and withstand pressures as high as 3,000 lbs. oil per sq. in. without leaking.

If you have critical flat surfaces that require extremely fine finishes, close sizing and extreme flatness—and would like to produce them in the best and least expensive manner—it will pay you to get the advice of Blanchard engineers.

Simply send us the data, with samples if available and practical. This Blanchard Service is of course free and does not obligate you.



V-348

BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

What's in
VERMONT
this month?

AUTOMATIC LOADER DOUBLES PRODUCTION AND HALVES COSTS. Because of such factors as heavy stock removal, large size and tough material, many internal grinding jobs consume enough time so that one operator can run two machines. He can unload and load one while the other is grinding. On the other hand, small work and light cuts, requiring short grinding time, will often keep one operator busy just with unloading and loading the work. By increasing the number of machines, the manufacturer can increase production but cannot necessarily reduce his cost per piece.

A manufacturer who had installed a Bryant No. 109 internal grinder recently had the problem of doubling production without buying another machine. He called in "the man from Bryant." A study showed that reduction of loading and unloading time was the only answer.

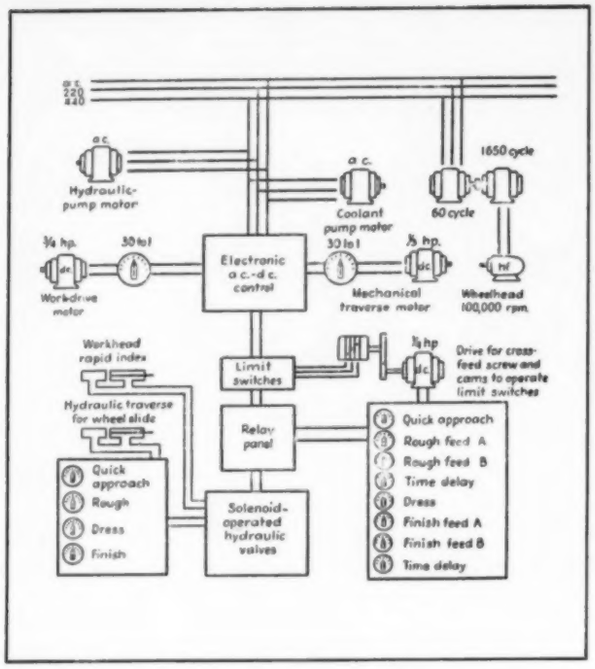
Bryant engineers designed an automatic loader and ejector, timed to unload as the diamond was dressing the wheel for the next work cycle. Production was increased from 160 pieces per hour to 320 per hour, and, at the same time, the operator was relieved of his major duties. Costs were cut in half.

The chart shows that the shorter the grinding time within the machine cycle, the greater the opportunity for profits from the use of automatic loading devices.

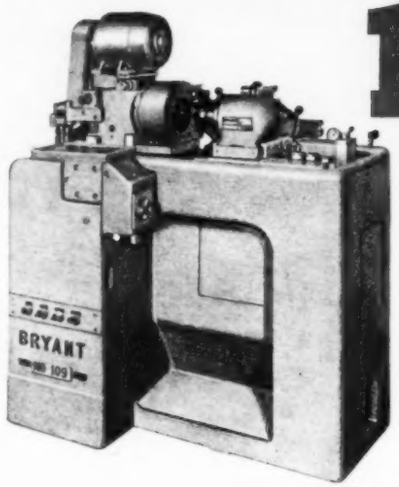
Every manufacturer is interested in saving costs, reducing the expense of materials handling and increasing production. Bryant is interested in helping manufacturers achieve these economies.

It won't cost to inquire.

Bryant Chucking Grinder Co., Springfield, Vermont, U.S.A.



BRYANT 109



AUTOMATIC INTERNAL GRINDER

The Bryant No. 109 Internal Grinder is designed for high precision production of holes from ¼ to 2½ inches in diameter. Other Bryant equipment will grind holes through the complete range up to 60 inches diameter swing. Write to the factory for full information.

SPECIFICATIONS

Total swing	9 inches
Will grind bore diameters	¼ to 2½ inches
Maximum traverse	6 inches
Maximum hole depth	3 inches
Will grind included angle	90°
R.P.M. of work spindle	200 to 2,400 R.P.M.
Net weight	3,000 lbs.

Floor space — 62 inches x 52 inches (with coolant tank)

SLIDES
Preloaded ball slides for both cross and longitudinal motion.

WORKHEAD
Ball bearing spindle, variable speed electric drive, 200 to 2,400 R.P.M.

WHEELHEAD
Precision ball bearing wheelhead with built-in high-frequency electric motor — speeds up to 100,000 R.P.M.

TRAVERSE
Hydraulic — 4 stations in automatic cycle, each variable — see drawing.

CROSS FEED
Eight variable stations in automatic cycle — see drawing.

POWER
Machine operates from standard AC current.

BRYANT INTERNAL & EXTERNAL THREAD GAGES. Bryant thread gages are made in three standard models for the fast, accurate, visual inspection of threaded parts. These models cover the range from ⅜" to 5" internal, and 3/16" to 5" external. Write for Catalog No. G for details.

You can *"See the Difference"* with a BRYANT GAGE

It is no longer necessary to "feel for fit" with plug and ring gages when inspecting threads. The Bryant Thread Gage shows, on a dial indicator, whether a thread will assemble properly with its component.

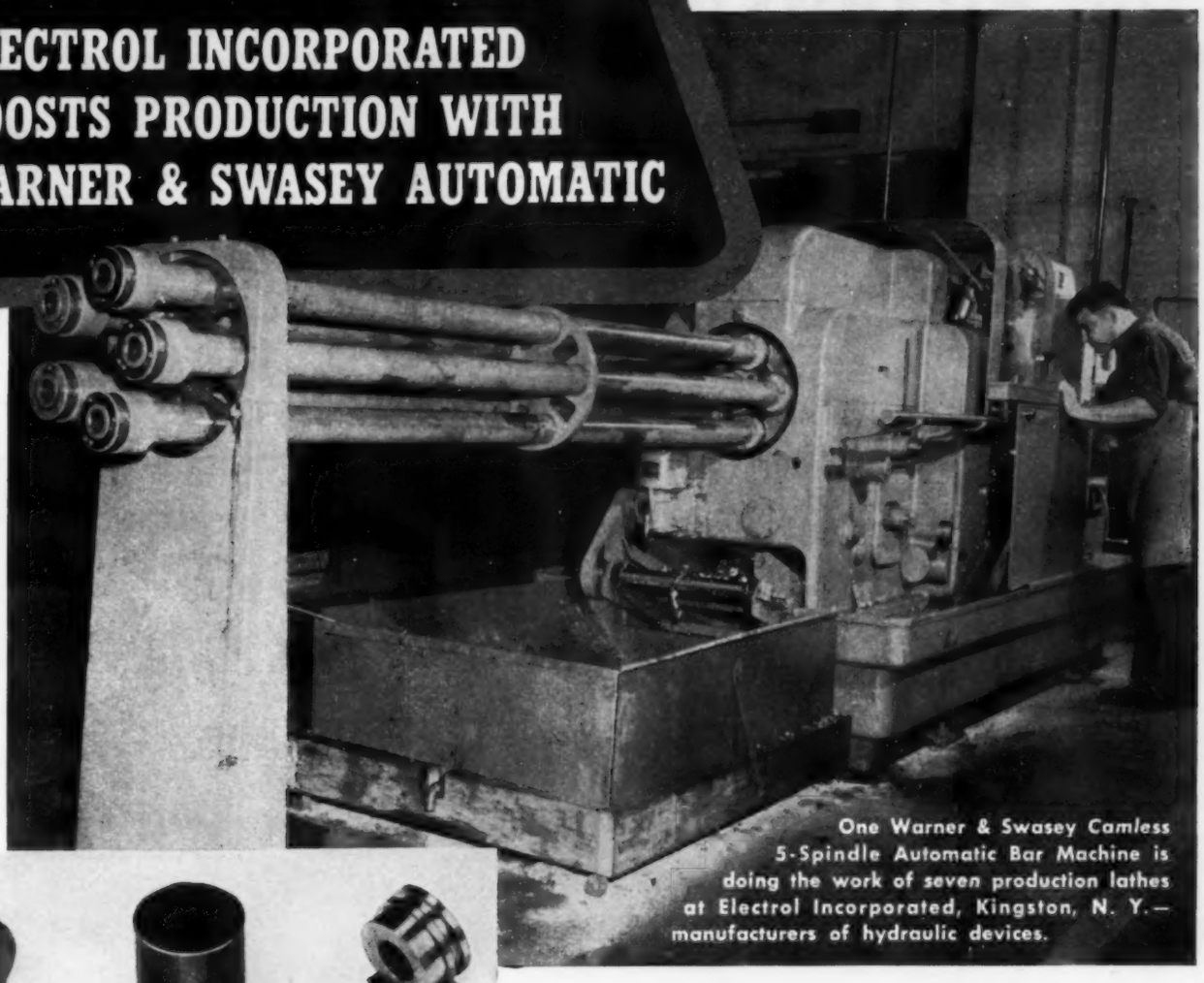
At a glance, anyone can compare threaded parts with a master and tell the whole story immediately — size, presence of burrs, out-of-roundness, accumulated inaccuracies of pitch, lead, diameter and thread form.

It's fast too. The design incorporates three thread segments, two stationary and one movable. The segments are operated by a thumb lever — the part is dropped between the segments — the lever is released, causing immediate contact of segments to threads — a one third turn of the part inspects it all over.

Send samples or drawings for a complete story on how Bryant can save inspection money for you.

Bryant Chucking Grinder Co., Springfield, Vermont, U.S.A.

ELECTROL INCORPORATED BOOSTS PRODUCTION WITH WARNER & SWASEY AUTOMATIC



One Warner & Swasey *Camless* 5-Spindle Automatic Bar Machine is doing the work of *seven* production lathes at Electrol Incorporated, Kingston, N. Y.—manufacturers of hydraulic devices.

These parts are typical of the many jobs now being produced at new high levels of efficiency in spite of short runs that average only 550 pieces per lot.

THE ELECTROL STORY

- ★ Production increased 5 to 10 times
- ★ Labor cost reduced 93%
- ★ Capital investment reduced 66%
- ★ Power cost reduced 71%
- ★ Floor space reduced 70%
- ★ Both management and operators approve— NO CAMS TO CHANGE

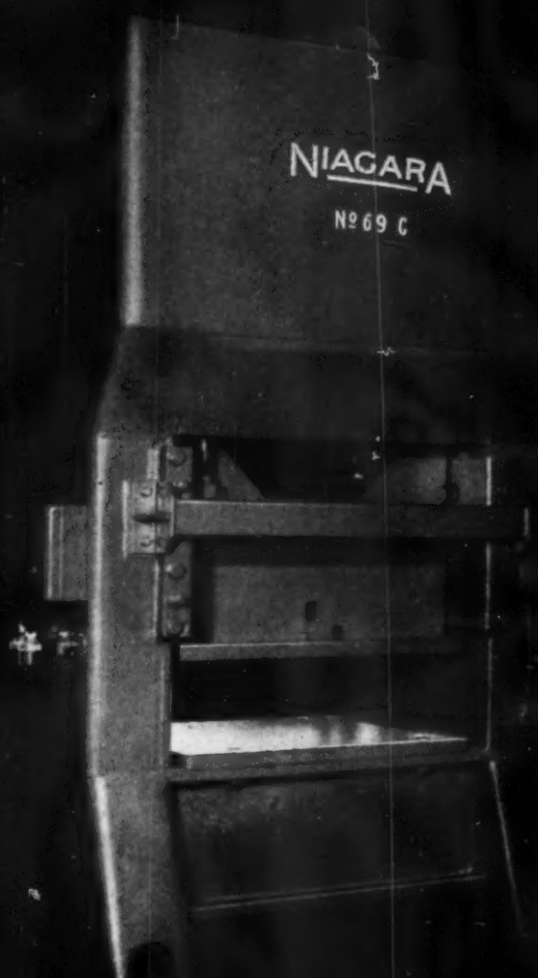
to set up a Warner & Swasey CAMLESS Automatic!

WARNER & SWASEY Machine Tools *Cleveland*

Turret Lathes, Multiple & Single Spindle Automatics, Precision Tapping and Threading Machines

FOR ADVANCED DESIGN *look into....*

NIAG



Niagara Double Crank Press

Niagara Deep Throat Press

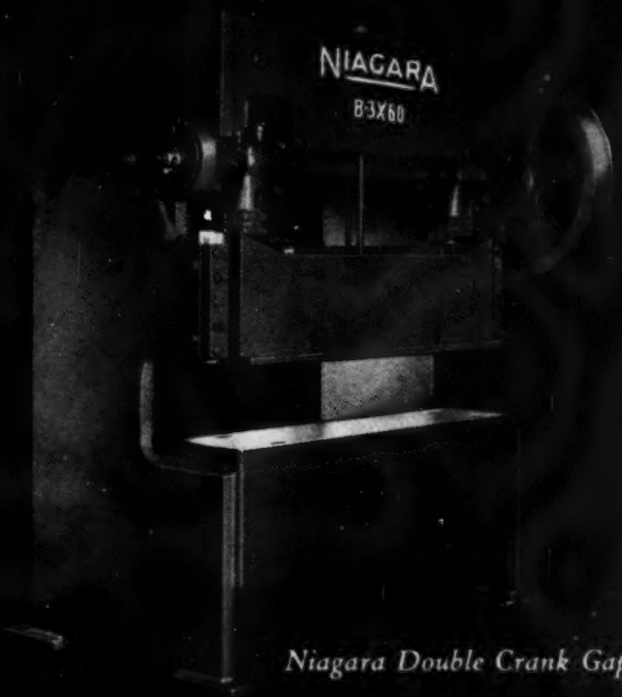
Niagara Underdrive Shear

NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, N. Y. Distric

NIAGARA

• The modern design of Niagara Presses, Shears and other machines for plate and sheet metal work is proof of the Niagara talent and experience that is built into them. Men responsible for economical production appreciate these results of Niagara engineering,—high hourly output... convenient operation... accurate work... reliable, uninterrupted performance with minimum down time... low maintenance cost.

Write for Bulletins



Niagara Double Crank Gap Press

America's most complete line of

PRESSES, SHEARS, TINNERS TOOLS AND MACHINES FOR PLATE AND SHEET METAL WORK

Y. District Offices: Detroit, Cleveland, New York

NEW *Life-Line* MOTORS NOW AVAILABLE

WESTINGHOUSE NOW OFFERS *IMMEDIATE DELIVERY* ON *STANDARD* LIFE-LINE MOTORS . . . IN RATINGS FOR 60% OF INDUSTRY'S REQUIREMENTS

To meet industry's urgent need for more—and better—motors, Westinghouse embarked two years ago on the biggest engineering and manufacturing program ever undertaken in this field.

Industrial buyers were surveyed to find the improvements most desired in existing standard motors. These improvements were incorporated, for the first time, in a single motor—the Life-Line—*a motor designed, from scratch, to user specifications.*

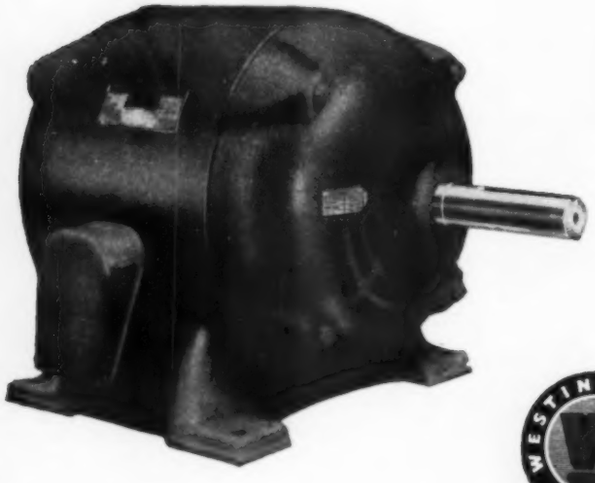
To build the Life-Line motor, a complete new plant was purchased, tooled and equipped from the ground up, with machines and new techniques never used before to manufacture motors.

Today, we announce the attainment of our first objective.

The new Life-Line motor is now available from stock, in standard types from 1 to 15 hp.

This objective was selected as of first importance, since 60% of standard, integral horsepower motors required by industrial users fall in this classification. Motor types included in stock are described on the opposite page. On "near-standard" motors, also described, short deliveries are available in these sizes.

Improved deliveries on special types and larger ratings will be the subject of future announcements, as quickly as increased output makes them possible. Watch for them . . . phone your orders to your nearest Westinghouse representative. Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. J-21497



Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Life-Line motors

FROM 1 to 15 HP* FROM STOCK

WHAT IS MEANT BY "STANDARD" MOTORS

"Standard" motors include drip-proof, splash-proof, totally-enclosed, fan-cooled and some totally-enclosed, non-ventilated complete motors, ball-bearing type, having standard electrical characteristics (220/440 volt, 2 or 3-phase, 50 or 60-cycle, standard speed torque and time-temperature characteristics).

Available from stock in ratings indicated below. Very short delivery on any standard non-stock rating in these frame sizes.

TYPES INCLUDED AS "NEAR-STANDARD" MOTORS

"Near-standard" motors are those with minor modifications, which include such items as double shaft extensions, NEMA standard B and C flanges, special No. 1 insulation, round frame, conduit box opposite standard, squeeze connectors instead of conduit box, TENV motors, partial motors, 50-cycle, 40° C. rise open motors, etc.

Short delivery in frame sizes listed below.

Life-Line A-C, Single-Phase, 60-Cycle, 110-220-Volt, Heavy-Duty Type CAP Capacitor-Start, Induction-Run Motors

HP	RPM	FRAME	VOLTS	IN STOCK
1	1750	203	220	✓
1½	1750	204		

Life-Line A-C, 3-Phase, 60-Cycle, Squirrel-Cage Motors

HP	RPM	F		ENCLOSURE TYPES IN STOCK

*REMEMBER?

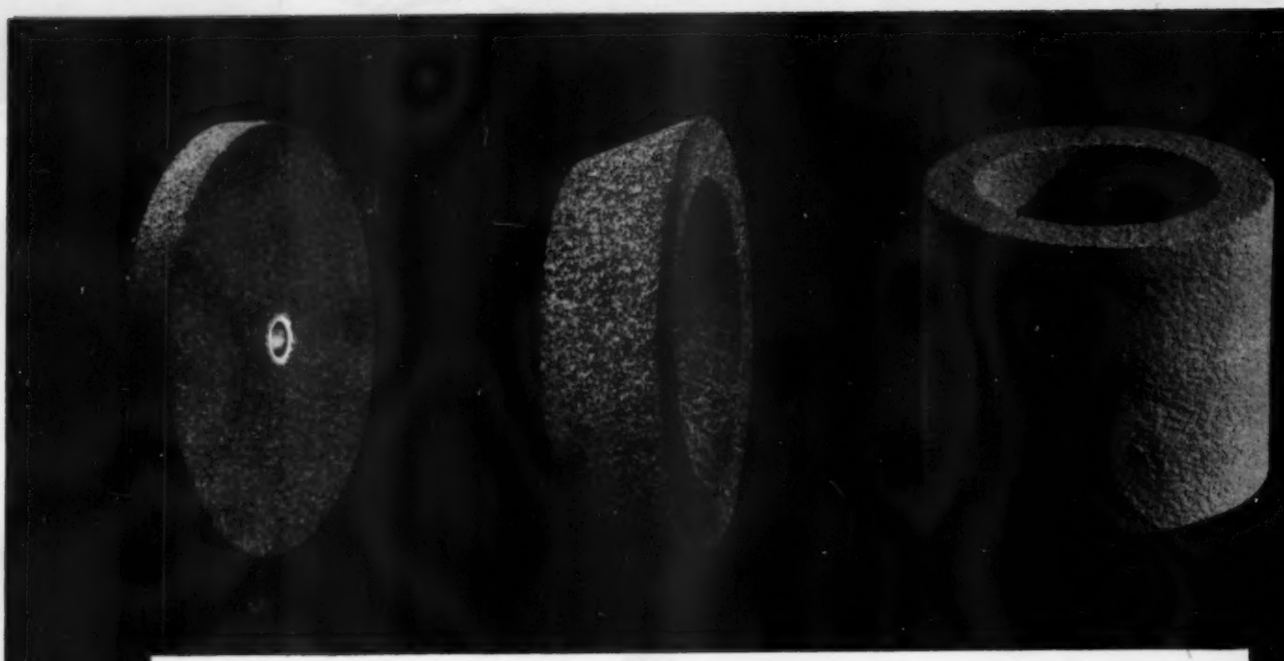
This announcement was published last spring—And now...

STOCK to 6 WEEKS Delivery

ON STANDARD 20 TO 75 HP MOTORS 445 FRAME AND SMALLER

Here's good news for motor users. Westinghouse squirrel-cage motors . . . open or splashproof, NEMA designs B and C, frames 364 through 445 . . . can now be obtained in 6 weeks *or less.* Many are in stock. Even the larger sizes, up to 200-300 hp, now have reduced shipping schedules—the shortest since 1942.

Your local Westinghouse representative will give you specific information on the motors you need . . . in answer to your phone call.



Trim high grinding costs for Christmas

Grinding costs can take a trimming this Christmas season and for many seasons to come. If you would like to shape your production costs by paring down your dressing expenses, sprucing up high stock removal and long wheel life, Peninsular engineers may be able to help you.

Manufacturers in over fifty industrial fields have been shown how to trim down grinding costs by Peninsular consultants. Since 1889, Peninsular has had a program of study and experimental research designed to help them with their particular grinding problems. *Why not call on Peninsular engineers to study your grinding job?*

First, they will conduct an on-the-grounds analysis of your grinding machines, the methods you employ, and the materials you grind. Correct wheel formulas are then drawn up and presented to you. Our engineers will include recommendations developed to reduce your costs and increase your production.

Thought for any season: Every Peninsular grinding wheel is specifically designed for a particular grinding job.

The Peninsular Grinding Wheel Co., 729 Meldrum Avenue, Detroit 7, Michigan. *Sales Offices:* Chicago, Philadelphia, Buffalo, Cleveland, Pittsburgh, Houston, St. Louis, Cincinnati.

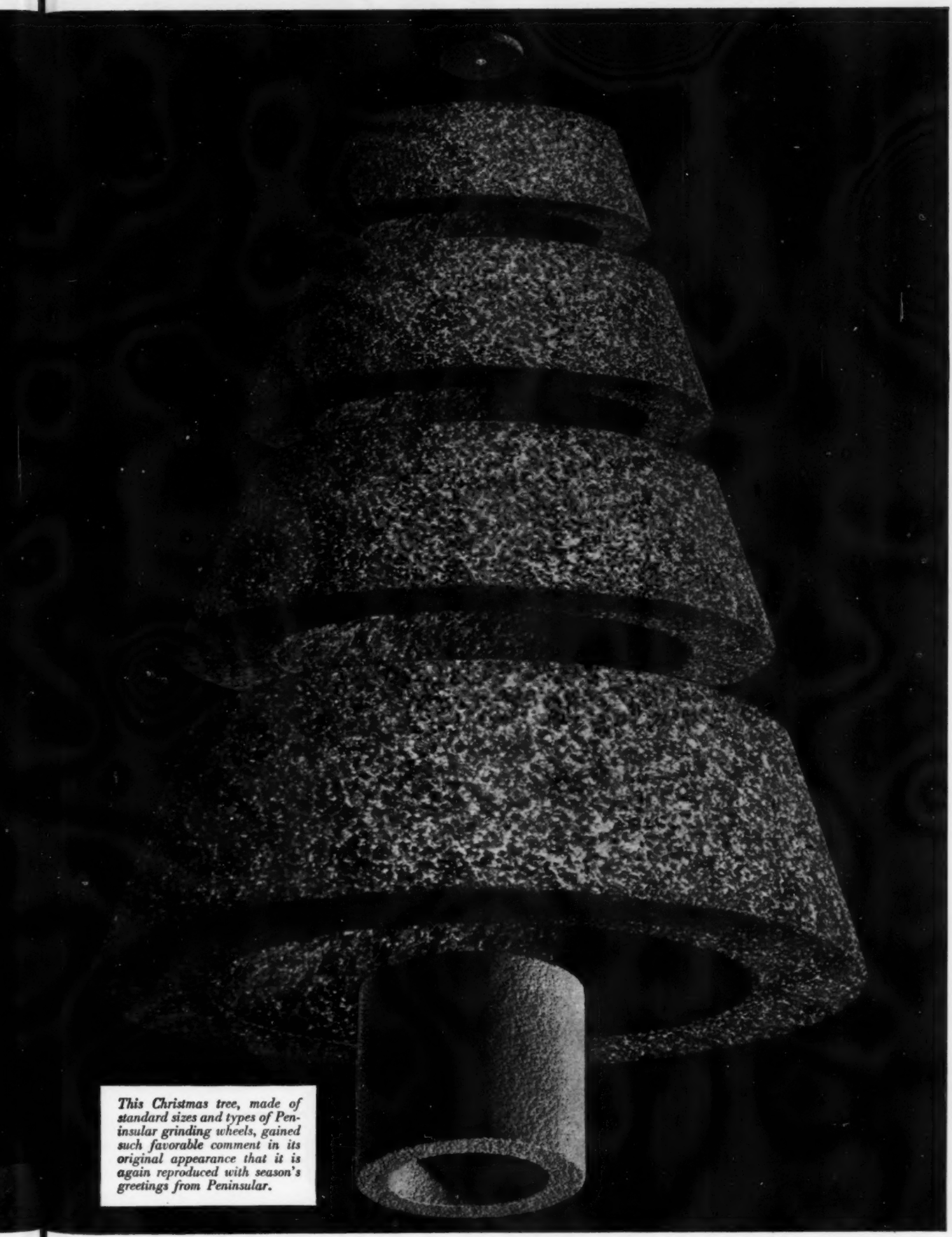
PENINSULAR

INDIVIDUALLY PENINSULAR *ENGINEERED*

GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS



This Christmas tree, made of standard sizes and types of Peninsular grinding wheels, gained such favorable comment in its original appearance that it is again reproduced with season's greetings from Peninsular.

Reaming

accurate, straight, round holes

With
BARBER-COLMAN
CARBIDE TIPPED
REAMERS

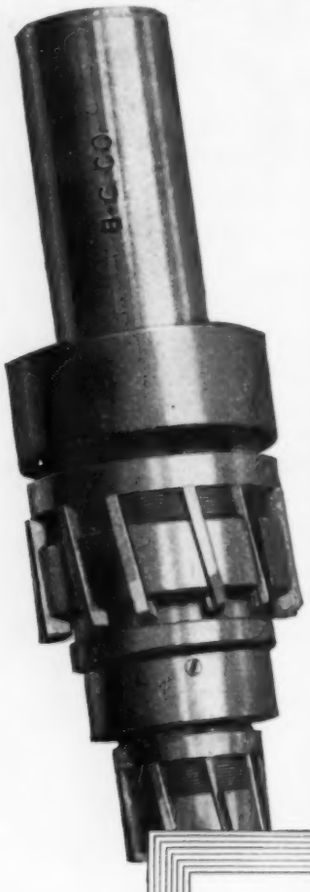
Sand pockets in these motor truck differential housings caused early dulling of high-speed steel reamers and unsatisfactory finish on the reamed surfaces. Barber-Colman Carbide-Tipped Inserted Blade Reamers were tried, and tool life jumped from *150* to *3000* pieces per sharpening.

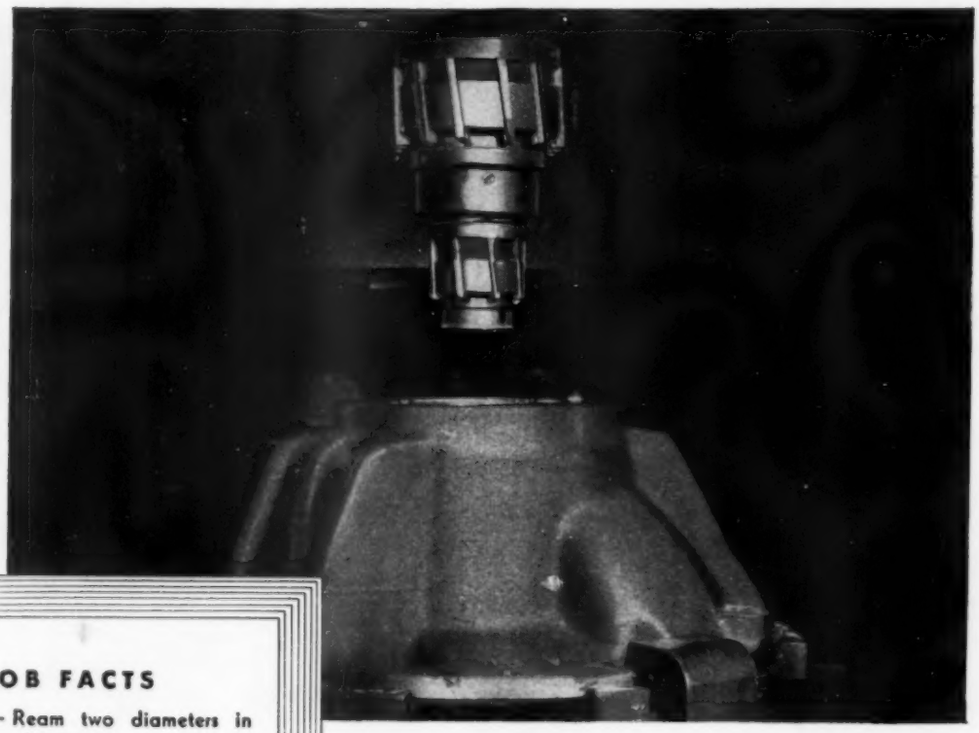
These reamers are designed with irregular blade spacing, and special *cutting* and *relief* clearances to provide smooth cutting action. Two holes are reamed straight and round, in alignment. Diameters are held within .001". The ability of the carbide to resist wear in this abrasive material greatly improves the finish, and the irregularly spaced blade design has eliminated the tendency of the reamer to *pattern* and form *welts*.

Consult Barber-Colman Reamer Engineers for application of Carbide-Tipped tools to your reaming problems.

Barber-Colman Company

GENERAL OFFICES AND PLANT 121 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.





JOB FACTS

Operation — Ream two diameters in alignment

Material — Malleable Iron Casting

Tool Life — 3000-4000 castings per sharpening

Tolerance — Diameters finished within .001"

BARBER COLMAN — MODERN MACHINES DEMAND *Modern* CUTTING TOOLS

Lands savings on fish pole grinding...

Using a taper grind, a midwest plant makes fishing rods from solid bar stock. Stock removal ranges up to a maximum of .052 inches.

Formerly, production averaged only 100 pieces per wheel dressing. Wheel wear was .045 inches, and wheel dressing removed an additional .025 inches.

At the suggestion of a Standard Cutting Oil Engineer, Stanicool HD Soluble Oil was introduced on this job. Production jumped to 500 pieces per wheel dressing. Wheel wear between dressings was eliminated.

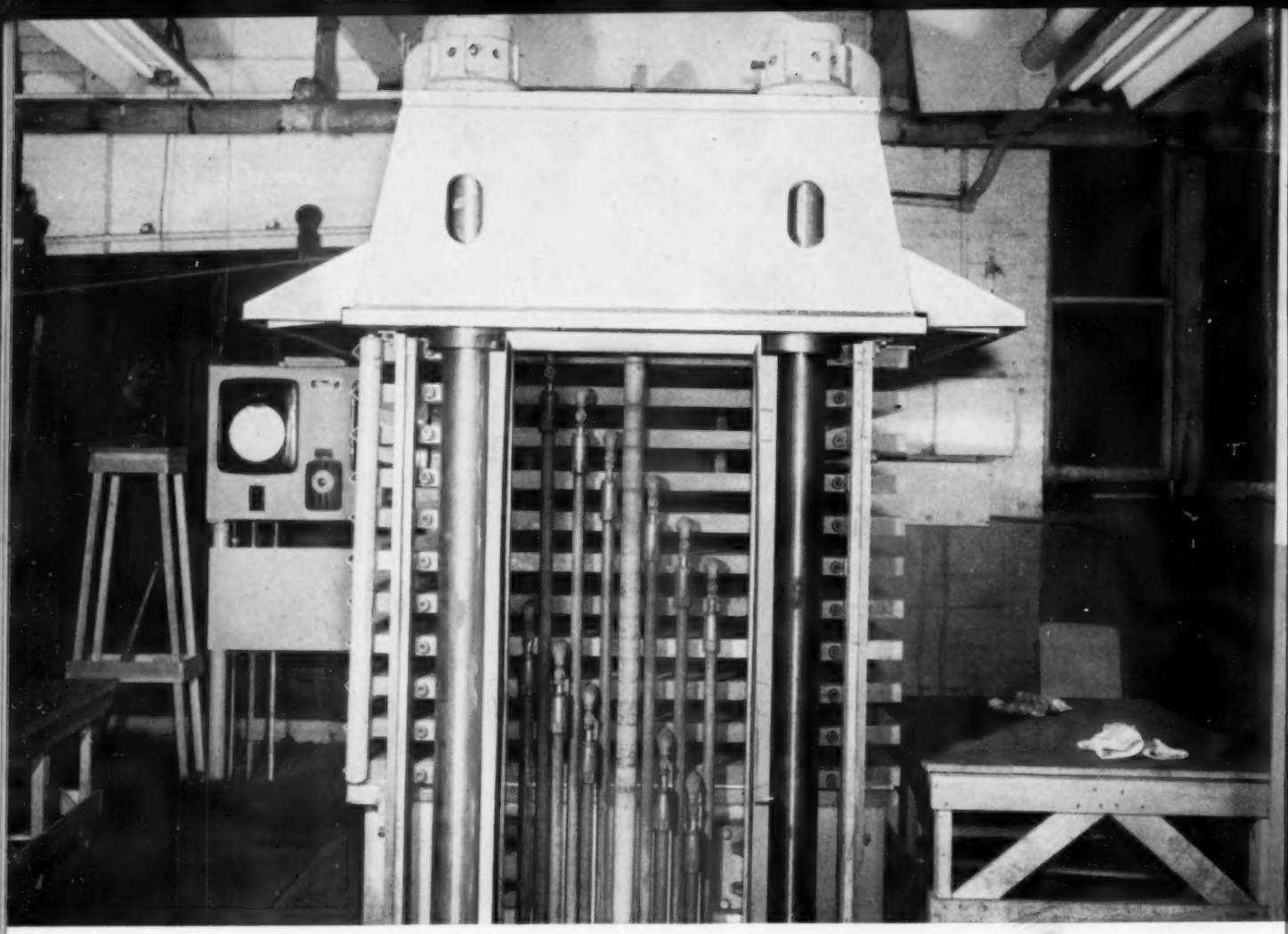
That's *really* landing savings—five times as many pieces, one third as much wheel wear! Fewer dressings and less wear on wheels cut tool costs 20%.

A superior coolant, Stanicool HD Soluble Oil also meets the requirements in many cutting operations. To replace costly cutting fluids or to improve tool life and production on your machining operations, try "Stanicool HD."

Stanicool HD Soluble Oil

If your plant is located in the Midwest, write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, to secure the services of the Standard Cutting Oil Engineer nearest you.

STANDARD OIL COMPANY (INDIANA) STANDARD



Solves heat-and-water problem...

Lubrication of the telescopic steam joints on a hot-plate veneer press was a continual problem for a midwest furniture manufacturer. The job required a grease that would withstand temperatures of 240° to 260°F. and the severe washing action of steam and water.

Conventional greases failed to meet these requirements. Joints had to be lubricated frequently. This interfered with production and resulted in excessive consumption of the lubricant.

A Standard Oil Lubrication Engineer suggested that Stanolith Grease No. 57 be used. This is a lithium soap product capable of standing up under high temperatures and of resisting the washing action of water. Since the switch to "Stanolith," the joints have been lubricated between shifts with no interruption of production. Lubricant consumption has been reduced 40%.

Stanolith Grease No. 57

Where the combination of heat and water causes lubrication difficulties, try Stanolith Grease. A Standard Oil Lubrication Engineer will be glad to give you more data on this versatile product. If your plant is located in the Midwest, write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, to secure the services of the engineer nearest you.

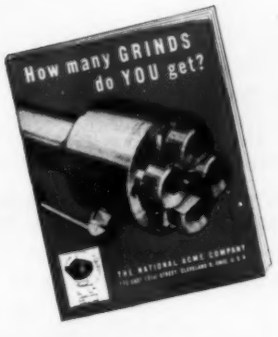
STANDARD OIL COMPANY (INDIANA) STANDARD

NOW!

AVAILABLE FOR PROMPT DELIVERY*

VERS-O-TOOL
Namco Style DR Revolving Head Vers-O-Tool equipped with the new adjustable blade chasers—economical for short-run thread-cutting.
Namco Style DR Revolving Head Vers-O-Tool equipped with the famous circular chasers (interchangeable with adjustable blade chasers)—ideal for long-run thread-cutting.

These Cost-Cutting Namco Vers-O-Tool Twins



JUST OFF THE PRESS—This interesting, illustrated 24-page booklet describes the advantages of Vers-O-Tool adjustable blade chasers, circular chasers and hollow mill cutters. Ask for Bulletin D-48-A.

For thread-cutting at its economical best you can count on Vers-O-Tools—*available now.*

Either the new, lower-priced adjustable blade chasers, or the famous circular chasers can be put to work cutting costs in *your* shop—and both are interchangeable on the same Vers-O-Tool head, whether you use the stationary, revolving or Brown and Sharpe type. With this exclusive Namco combination you can cover the entire production range for a given size—with only a fraction of the usual tool investment.

May we show you figures on how this versatile Vers-O-Tool team can cut your threading costs?

***Also 24-hour deliveries on standard stockable NC and NF chasers and blocks**

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme • Gridley 4 • 6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

Van Keuren Wire Type Plug Gages

NO GO .752
GO .750
(1)
Giant's grip, wedge lock handle. Range .500" to 1.000".
(2)
Safety, bushing type handle, for 2" length wires. Range .020" to .500"
GO .250
NO GO .252
(3)
Wafer type handle. Weight only 1/30 oz. Range .002" to .020"

THESE EXTRA VALUES

FULL 1⅞" AND 2" LENGTH GAGING UNITS
ALWAYS ACCURATE — EXPERTLY ENGINEERED
LONG LIFE LIGHT ALUMINUM HANDLES
PROMPT DELIVERY FROM A STOCK OF 2 MILLION WIRES

TOOL ROOM SET NO. 80
Drill sizes from 1 to 80 (.228" to .0125").
Price $425.00

The New 1948 VK Catalog and Handbook No. 34, is a 208 page manual indispensable for engineers, designers, inspectors, toolmakers and machinists. It contains simplified formulas and accurate tables for measuring spur gears, helical gears, splines and worms. New and epoch making formulas and tables are presented for the first time for the exact measurement of 29, 40 and 60 single and multiple start screw threads and worms.

It includes a complete resume of American & European screw thread systems, new methods of measuring included angle of screw threads, a new method of inspecting flat ring seal surfaces with light waves, and other valuable information. Price $1.00 each postpaid.

Write for your copy

Wire type plug gages were originated by The Van Keuren Co. in 1925. They have resulted in gigantic economies for American industry and have been widely imitated.

Only in Van Keuren Wire Type Plug Gages is the maximum value of the gage dollar fully realized. The light aluminum handles are especially designed for utility, holding power and long life. The full length gaging units have a uniform high hardness, exceptional finish, long wearing qualities and superlative accuracy.

You do not need to inspect Van Keuren Plug Gages. Our double inspection at the factory takes care of that expense for you. There is no time lost in waiting for replacements.

Van Keuren prompt deliveries will enable you to cut your gage inventory to a minimum.

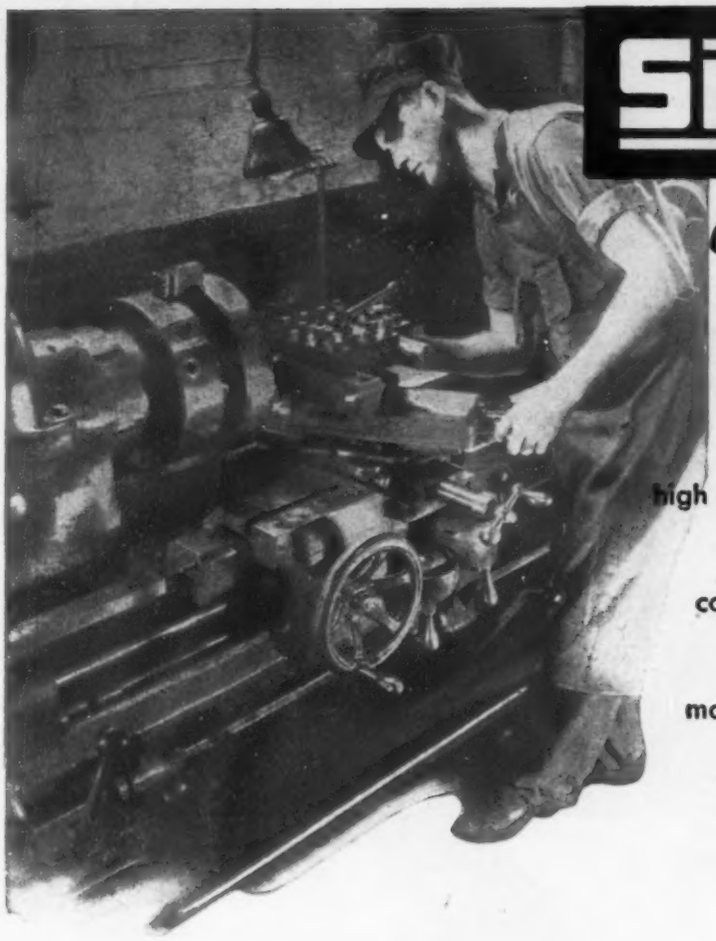
On your next order specify VK Wire Type Plug Gages. VK Carboloy for long runs because of the enormous saving in cost per hole gaged . . . VK Carboloy for fussy jobs because of the infinitesimal gage wear and insurance that all the parts will be within specified limits. VK Tool Steel . . . VK High Speed Steel . . . Precision Chromium Plate for less exacting jobs. You will be assured of the best in accuracy, quality and delivery.

For Super Service . . . Phone Watertown 4394

THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.

29th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

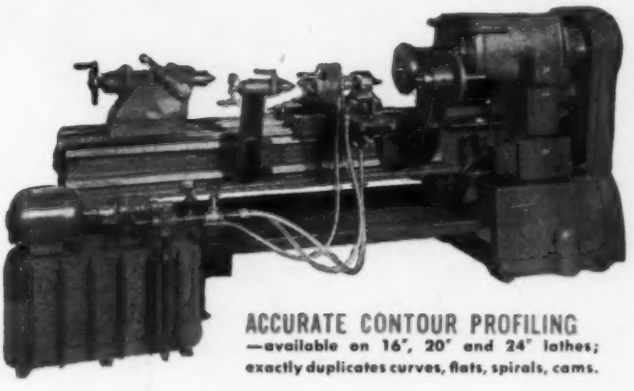


SPRINGFIELD

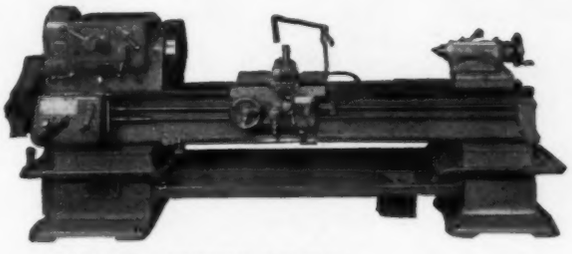
Geared Head LATHES

Springfield builds a complete line of precision, high quality, geared head lathes. Every type of lathe built by Springfield is especially designed and constructed to meet all the requirements of modern tooling, and to retain extreme accuracy through many years of full capacity production.

Write for catalogs and detailed specifications.

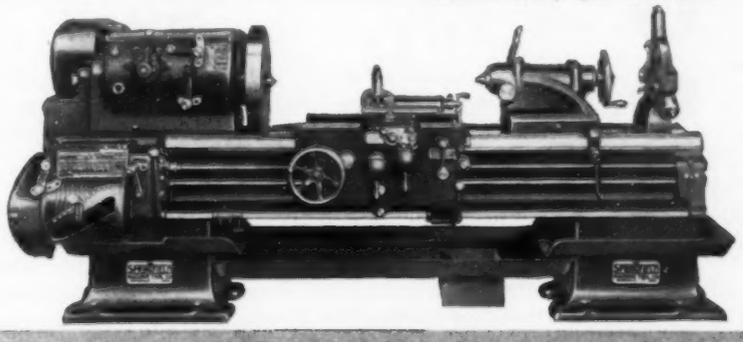


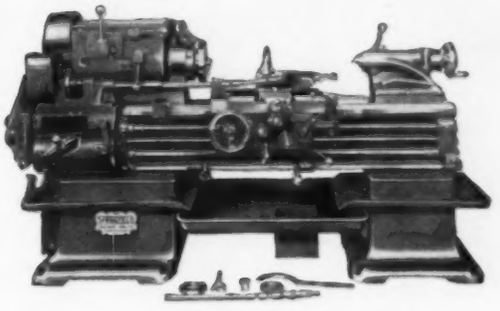
ACCURATE CONTOUR PROFILING
—available on 16", 20" and 24" lathes; exactly duplicates curves, flats, spirals, cams.



MANUFACTURING LATHE
—with unusually wide applications; capable of accurately turning, boring and facing.

SUPER DUTY LATHES
—made in 20" and 22" sizes; equipped with 16-speed geared heads.





TOOL ROOM LATHES
—made in all sizes including 24"; equipped with lead screw reversing mechanisms.

THE SPRINGFIELD MACHINE TOOL COMPANY

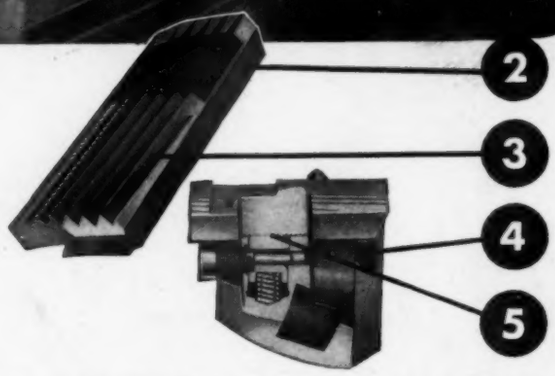
SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

Exclusive Representatives in All Principal Cities

JONES & LAMSON

Ground Thread Tangent Chaser Die Heads Produce Better Threads at lower cost



— because

1. They are hardened and ground throughout. The body is lapped on the face and in the dovetail slots. Chaser holder bearing surfaces are lapped into the body.
2. Chasers are guaranteed to produce threads of Class III fit.
3. Exact helix angle is ground into the chasers after hardening.
4. With a single set of chaser holders, any thread, within the rated capacity of the holders can be cut, regardless of helix angle, eliminating the expense and trouble of constantly changing holders for different helix angles.
5. Chasers are set quickly and easily.

If you are interested in greater economy and better quality in threading, write to us (*Department 710*) for complete information about our Die Heads.

Jones & Lamson

AVAILABLE IN STATIONARY & REVOLVING TYPES

TANGENT DIE HEADS

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

Manufacturer of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Double-End Milling and Centering Machines · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers · Ground Thread Flat Rolling Dies

KEEP YOUR MACHINES RUNNING...

DON'T STOP SPINDLES TO CHANGE TOOLS

MODERN-MAGIC CHUCK
AND COLLET EQUIPMENT

Increase your production through elimination of spindle stoppage for tool change. With Modern-Magic Chuck and Collet equipment, tools are quickly and easily changed as the spindle revolves at operating speed. Simple, advanced design makes Modern-Magic Chucks and Collets practically trouble-free. Sturdy, fool-proof construction insures longer accurate service. Your copy of Bulletin M-103 giving full information will be sent upon request. Today?

Only the ORIGINAL Modern-Magic Chuck and Collet Equipment carry the name "MODERN-MAGIC" and are manufactured by Modern Tool Works, Rochester, N. Y.

MODERN TOOL WORKS

DIVISION OF

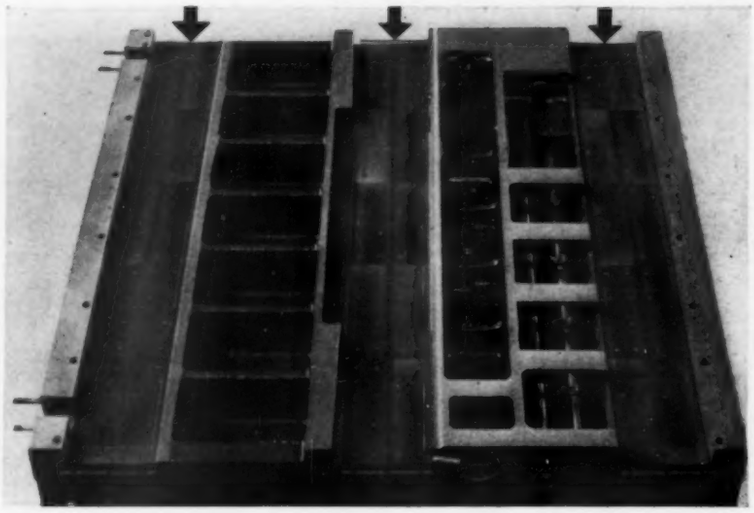
CONSOLIDATED MACHINE TOOL CORPORATION

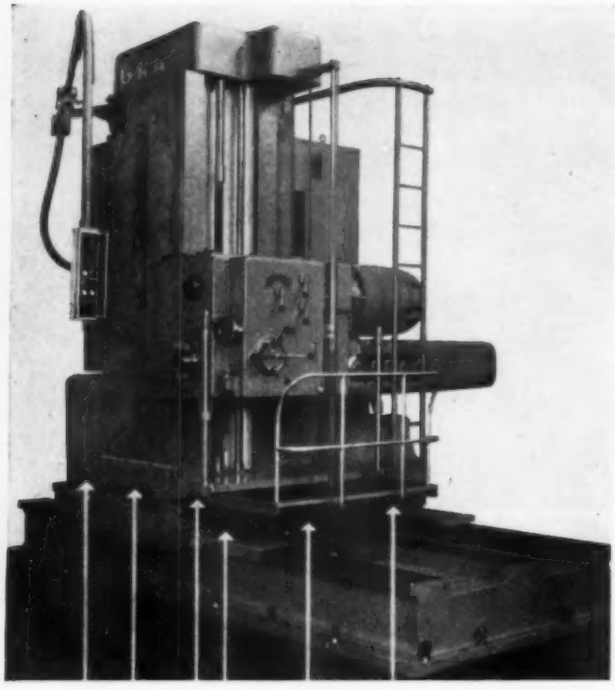
ROCHESTER 10, NEW YORK

NON-METALLIC WAYS

originated and perfected by the

G. A. GRAY *Co.*





GRAY NON-METALLIC WAYS

characterize GRAY

HORIZONTAL BORING
DRILLING *and* MILLING MACHINES

Cutting and scoring of these vitally important guiding surfaces is thus practically eliminated. The value of this epoch-making development is evident when you consider that a standard column and head weighs 25 tons.

Remember

A boring machine is no better than its ways. There is no adequate substitute for the Gray NON-METALLIC WAY.

Protected by Patent 2,378,343 and Patent Pending.

The G.A. **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

IF SEEING IS BELIEVING *You* BE THE JUDGE

Builders of Multiple Spindle Automatic Bar Machines emphasize the importance of substantial FRAME SUPPORT to *maintain* accurate, dependable, low-cost machine performance.

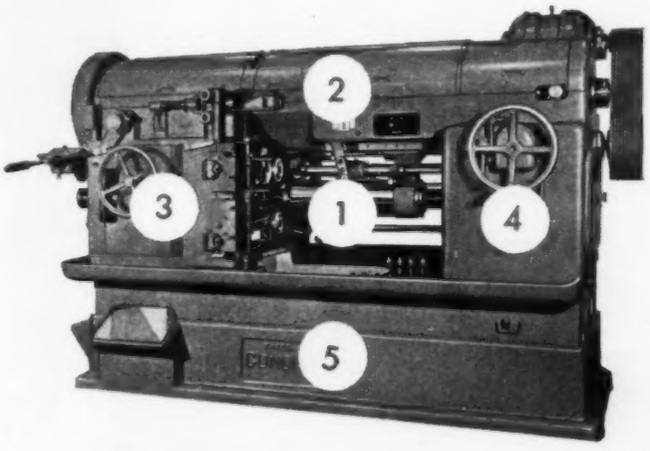
CONE long ago recognized this fundamental requirement and *did* something about it. In 1924 — in the CONOMATIC — an exclusive design of frame was introduced, a frame that made possible new and unequalled records for automatics in heavy duty forming and deep hole drilling operations, a frame that required no *redesigning* when carbide tools came along, and, a frame that remains today a standard for comparison in consistent, low-cost operation and maintenance.

CONOMATIC users benefit from the advantages of the CONOMATIC FRAME DESIGN, but you do not have to be a user to SEE WHY.

	MACHINE #1*	MACHINE #2	MACHINE #3	MACHINE #4	MACHINE #5
WORK & TOOL CAPACITY	✓				
WORK & TOOL SUPPORT	✓				
WORK & TOOL MAINTENANCE	✓				

*CONOMATIC

Why not use a chart to guide your purchases of Automatic Bar Machines? If you are already using a chart, perhaps you would like to compare it with the one that we have prepared. Write to us for a copy or ask your Cone representative.



(1) TOOLING AREA

of Conomatics is of horizontal type, open, roomy, well supported. The operating controls are adjacent and on both sides of the machine. All tool slides are exceptionally well built and supported by liberal bearing surfaces, with convenient means of adjustment; all tool slides are designed to accommodate quickly and maintain more substantially a general choice of various types of tools — for standard or special applications. Quick change pick-off gears, for work spindle speeds, tool feeds, and rotating tool spindles, are provided for an exceptionally wide range of work; they are positioned to save time and motion in change-overs.

(2) TOP SUPPORT

of Conomatics is the revolutionary "top bed", which identifies all Conomatics. It houses the single unit camshaft and centralizes all cams in a truly accessible, visible, quick-change, chip-free position, clear of the tooling area. Conomatic cams provide a smooth, powerful, synchronized drive to all tool slides and power operated mechanism.

(3) HEADSTOCK SUPPORT

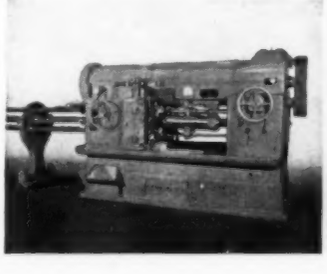
of Conomatics is a very substantial, triple unit support to the work holding and stock feeding members of these machines. It is the only multiple spindle automatic bar machine headstock support with an adjustment provision of both axial and radial take-up for the front bearing of the carrier.

(4) GEAR BOX SUPPORT

of Conomatics is a heavy-set unit that transfers and distributes power to the various functional mechanisms of the machine. It gives open-end facility to tool feed and attachment drive-gear change. It provides "direct drive" to all main toolslide attachment positions.

(5) BASE SUPPORT

of Conomatics is a massive, cam-free, bridge construction type of base member that supports the tooling area up close to the work and tool axis. It has a larger cubic foot capacity for chips and cutting coolant. Its size and weight is an important combination in the over-all support and maintenance of alignment that only Conomatic Frames can give to tools and work.



A comparison with ALL Automatics will lead you to

#3

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

new Bullard type "K" economies widen scope of MULT-AU-MATIC method

Higher Speeds Meet New Job Requirements. Designed to lower production costs of small and medium sized jobs in cast iron, steel and light metal alloys, the new BULLARD Type "K" Mult-Au-Matic provides a wide range of spindle speeds up to 900 rpm to get full productive capacity out of modern cutting tools.

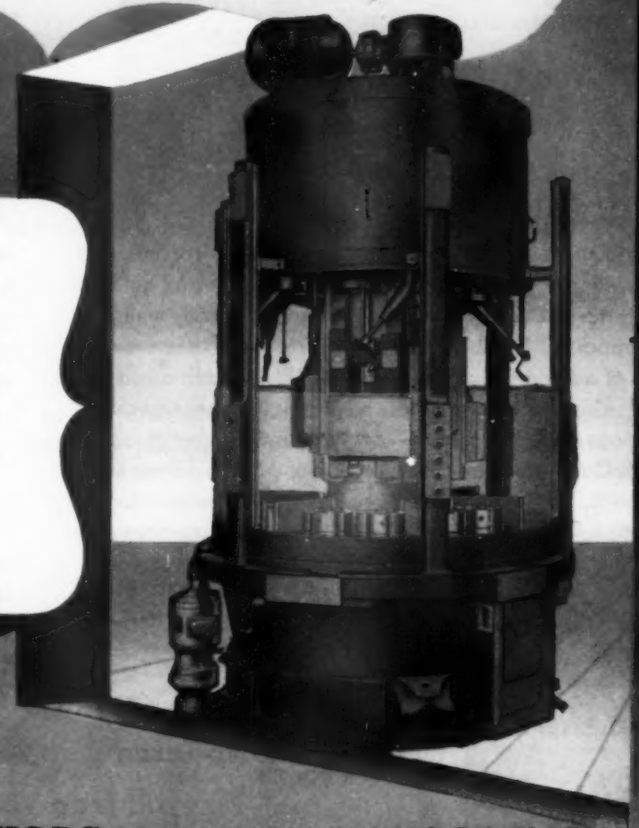
Saves Time Between Cuts. A newly developed index control mechanism permits faster return and advance of tool carrying heads and faster carrier index.

Higher Degree of Accuracy. New method of carrier index registry maintains repetitive accuracy from station to station, producing work to extremely close tolerances.

Improved Hydraulic Chucking Increases Efficiency. Work is chucked quickly by foot treadle control and automatically released as spindles return to loading station. Chucking pressure is adjustable to suit work characteristics.

Twin Spindles Double Production. Two of the four Type "K" models have twin spindles that deliver two finished pieces for every index cycle . . . a promise of lower production cost that is worth investigating further.

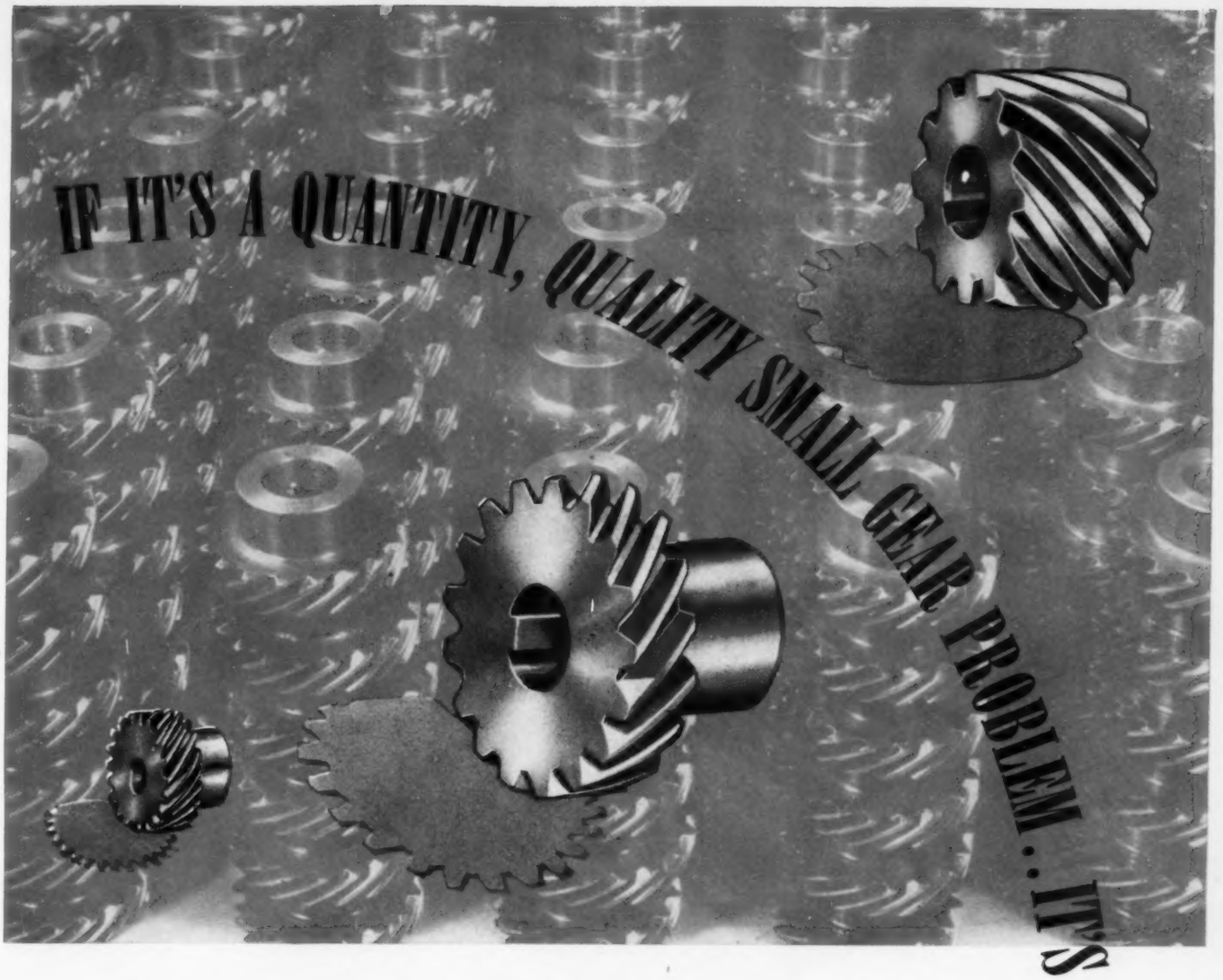
Write for complete information about the new Type "K" version of the Mult-Au-Matic method, one of the leading contributors to our modern American production system. THE BULLARD COMPANY, Bridgeport 2, Connecticut.



BULLARD Type "K" Mult-Au-Matics for work up to 10" in diameter come in four models: 6 or 12 spindles with speeds from 100 to 900 rpm, and 8 or 16 spindles with speeds from 98 to 880 rpm. 41 speed changes, 82 rates of feed, selective feeds and common speeds at all stations.

BULLARD

BULLARD CREATES *NEW METHODS* TO MAKE MACHINES DO MORE



CUTTING large numbers of small Gears with *extreme accuracy* is a highly developed specialty of ours! We've concentrated on *doing a better job* of this kind of work for more than 30 years! Many of America's biggest buyers of Fractional Horsepower Gearing depend upon us for *all* the gears they need. They have learned, through the years, that G. S. Gears invariably measure up to all expectations for uniform accuracy, smooth performance. Large, modern facilities together with an efficient, well-trained organization insure economical production and speedy deliveries. If you use small gears or have a problem in which they are involved, by all means consult with a friendly G. S. engineer. Get ideas, suggestions and moderate cost estimates. You won't be obligated to buy.

SEND FOR *free G. S. catalog-bulletin, describing many different types and applications of our Fractional Horsepower Gears.*

FRACTIONAL HORSEPOWER GEARS

GS

GEAR Specialties

Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

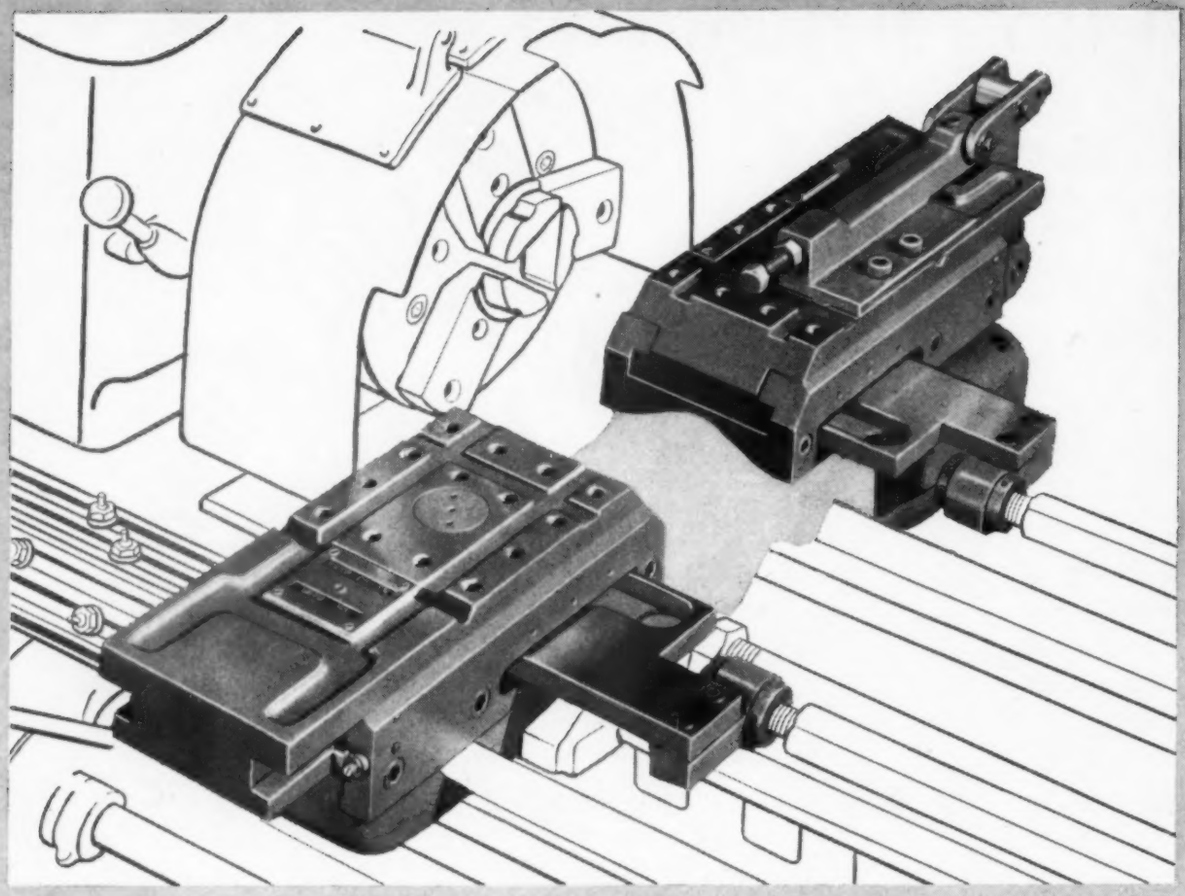
2635 WEST MEDILL AVENUE · CHICAGO 47, ILLINOIS

MEMBER OF AGMA

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

GISHOLT FASTERMATICS

(Automatic Turret Lathes)



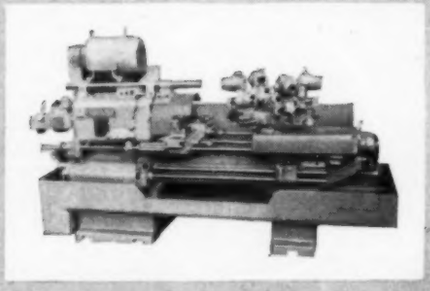
Separate front and rear cross-slides permit independent or simultaneous operation . . . providing utmost flexibility in tooling setups . . . *GREATER PRODUCTION

GISHOLT MACHINE COMPANY

Madison 3, Wis.

THE GISHOLT ROUND TABLE represents the collective experience of specialists in machining, surface-finishing and balancing of round or partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES
SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



* Each of the Fastermatic's independent cross-slides can be used as many times as necessary within the turret cycle. Thus, you can do more different jobs.

BETTER APPEARANCE LESS FINISHING

...AND THE LOW COST WILL SURPRISE YOU!

"The smooth inside surfaces reduce noise; their smooth exterior takes a better finish", says an oil burner manufacturer about this Alcoa Aluminum Casting.

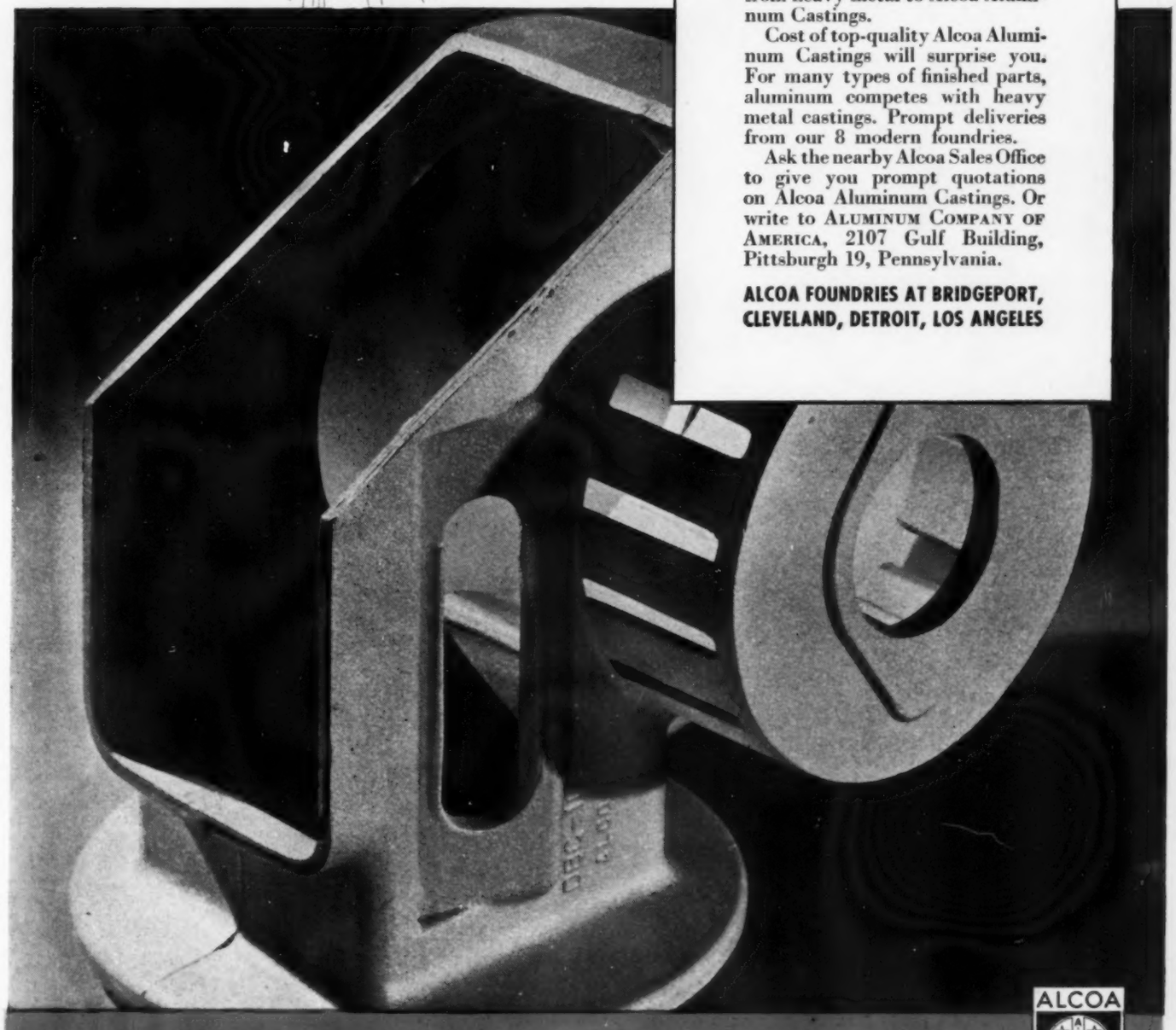
Smooth, solid Alcoa Castings keep their attractive, silver-grey finish on most jobs without paint or other protection. Aluminum never shows red rust. Paint or not, as you prefer.

Weight savings, too . . . as high as 50% with no loss of impact or tensile strength, when you switch from heavy metal to Alcoa Aluminum Castings.

Cost of top-quality Alcoa Aluminum Castings will surprise you. For many types of finished parts, aluminum competes with heavy metal castings. Prompt deliveries from our 8 modern foundries.

Ask the nearby Alcoa Sales Office to give you prompt quotations on Alcoa Aluminum Castings. Or write to ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FOUNDRIES AT BRIDGEPORT, CLEVELAND, DETROIT, LOS ANGELES



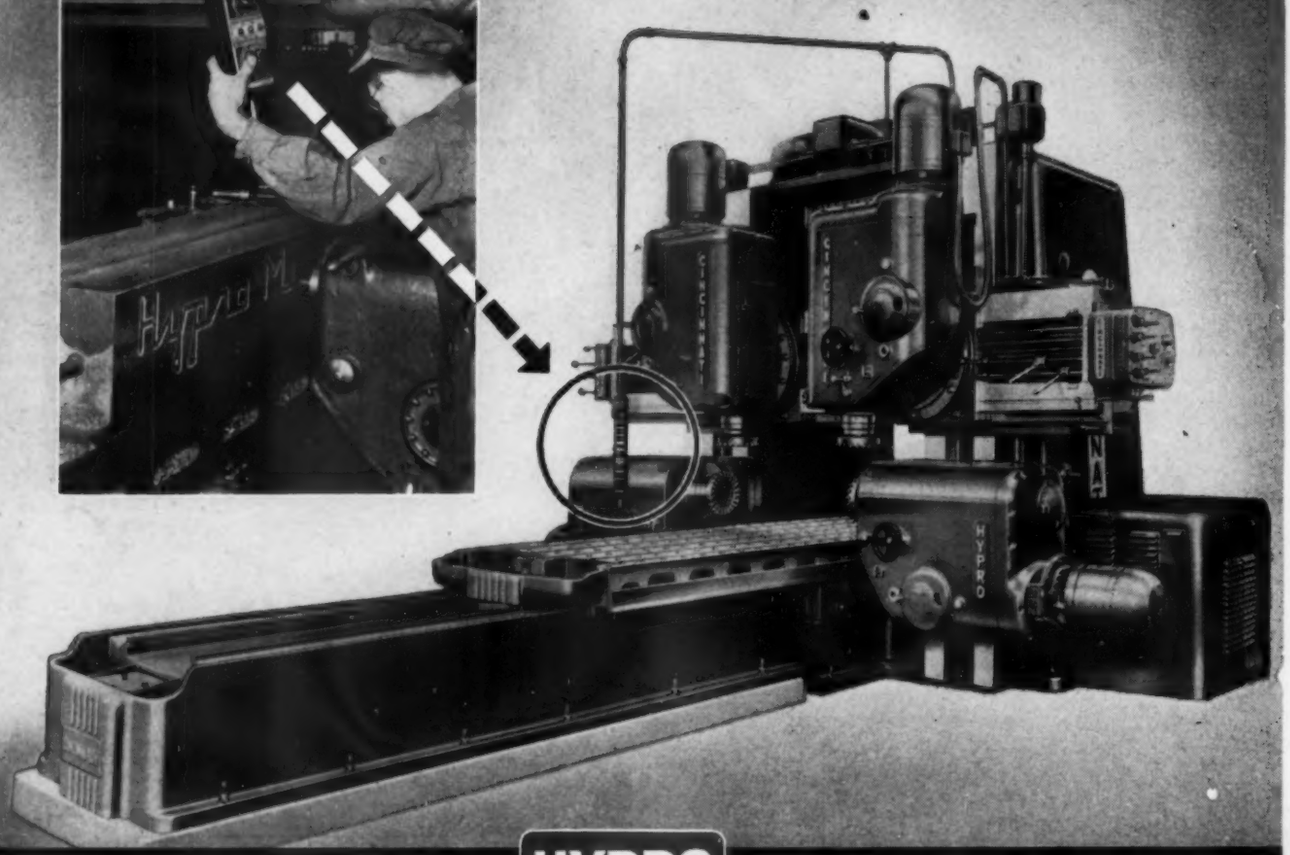
ALUMINUM CASTINGS *by* ALCOA

ALCOA ALUMINUM

NOW COMPLETE FINGER-TIP CONTROL FROM PENDANT STATION...

Hypro-electronic PLANER MILLER DRIVE

Photo on left shows operator milling the words Hypro Miller in cast-iron block — an unusual demonstration of the versatility and absolute control of any head or table from pendant station exclusively.



THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

ALLIS-CHALMERS

"Certified" Service

A BREAKDOWN on this 39-year-old Allis-Chalmers fan motor crippled operations at the plant of an important midwest electric utility. Immediate repair was vital. The Chief Engineer called the nearest Allis-Chalmers Certified Service shop. They picked up the rotor and returned it ready for service in less than twenty-four hours.

This is the kind of emergency cooperation you can expect from every Allis-Chalmers Certified Service shop. On everyday repairs and maintenance too, your Allis-Chalmers Certified Service shop will give you prompt service on Allis-Chalmers motors, pumps and transformers, using factory approved methods and parts. Every Allis-Chalmers Certified Service shop has been selected for skilled, personal, careful workmanship, adequate equipment and *service windedness.*

HOW TO FIND NEAREST SERVICE SHOP

Allis-Chalmers Certified Service shops are located in major industrial centers throughout the country. New shops are being appointed continuously and most smaller centers will soon be covered. To find the shop nearest you, call your closest Allis-Chalmers District Office.

A 2543

MOTOR DELIVERIES GREATLY IMPROVED

Many types of Allis-Chalmers Motors are now in stock! Many other types are available on short delivery! For motors from 1 to 200 HP, check your nearest Allis-Chalmers Authorized Dealer. For motors larger than 200 HP, check with the nearest District Office. You may be able to get what you need sooner than you think.

ALLIS-CHALMERS, 999A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

Pioneers in Power and Electrical Equipment from Generation through Utilization

ARMSTRONG

Drop Forged "C" CLAMPS

More Reliable . . .

Every characteristic essential to absolute reliability is built into ARMSTRONG Drop Forged "C" Clamps — maximum strength, extreme stiffness, extra large Tempered and Tested Screws, better "Tool Sense" and design.

That is why it is good policy to standardize on ARMSTRONG "C" Clamps . . .

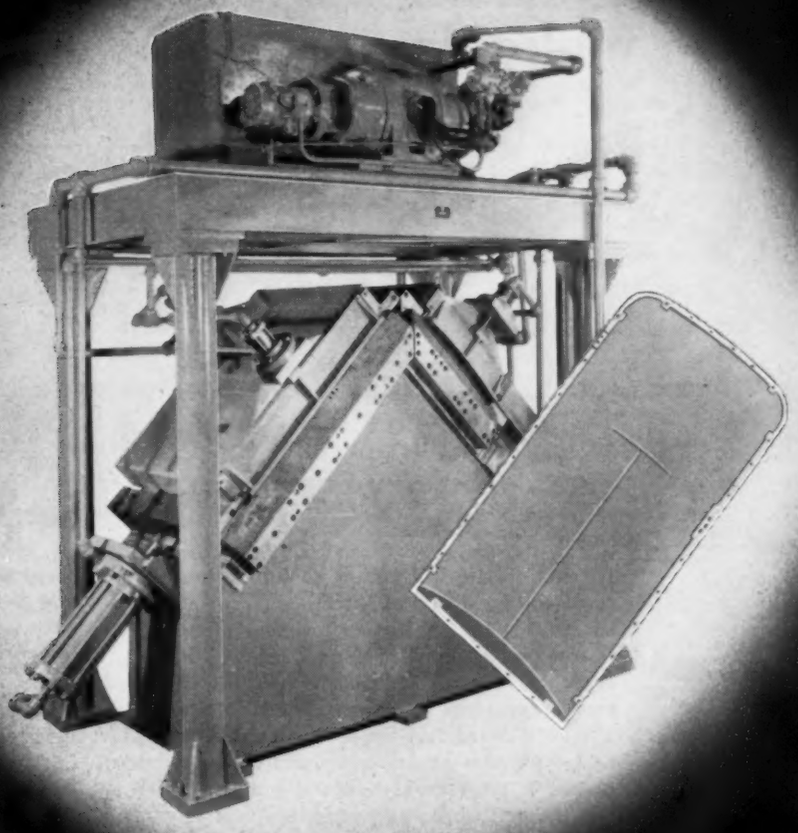
Your local ARMSTRONG dealer carries them in "Heavy Duty," "Medium Service," "Extra Deep Throat," "Spatter Resisting" and "Toolmakers" designs in a wide range of sizes.

STRONG

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. Armstrong Ave. **CHICAGO 30, U.S.A.**

NEW YORK • SAN FRANCISCO

IMAGINE!
1 PANEL—
7 SECONDS



HYDRAULIC FLANGE AND PIERCING MACHINE

speeds intricate panel fabrication for many end products

Vulcan's automatic flange and piercing machines are rapidly replacing older methods which use conventional punch press set-ups, multiple dies involving maintenance, and manpower. By applying the Vulcan Hydraulic Technique, presses are released for other work, labor charges reduced, and production increased amazingly. Considering the above application only . . . material moves to both sides of the machine, permitting bottom and hinge edge form and holes pierced on the one hand — top and handle edge together with holes pierced on the other, resulting in one complete panel each machine cycle, at 7 seconds.

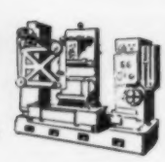
Vulcan Hydraulics
- Form
- Pierce
- Flange
- Assemble

The Hydraulic Machine principle for Die Operations can be utilized in many panel forming and piercing applications. Mail us your product part prints for our advise or quotation. No obligation.

Vulcan Tool Co.
DAYTON 10, OHIO, U. S. A.
COMPLETE TOOLING PROGRAMS

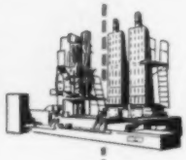
A message

to "the men who make dreams come true"

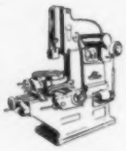


P&W
Automatic Duplicator

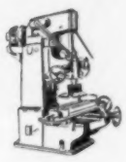
P&W
Die Sinker



P&W
Keller Machine

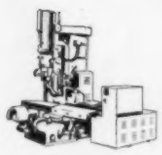


P&W
Vertical Shaper

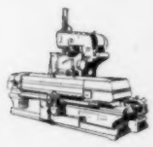


P&W
Jig Borer

P&W
Kellerflex



P&W
Jig Grinder



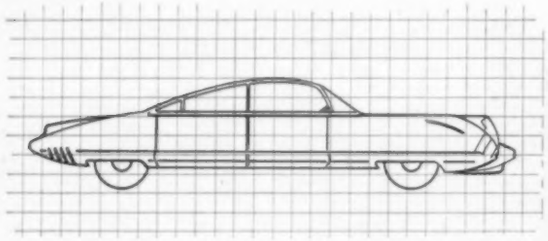
P&W
Surface Grinder

Whatever dies and molds your dreams require for transmutation . . . Pratt & Whitney can supply what it takes to make them

It's our job to know how to build the kind of precision machine tools you need in your business. Our experience and products are the source for the tools, dies and molds needed to produce your products. Designs no longer need to be hampered by die limitations if your shop is Pratt & Whitney equipped. No matter what tooling problem you have, there is Pratt & Whitney equipment that will make it. Smart shop executives plan their replacement and expansion programs around this equipment. Pratt & Whitney precision pays dividends and cuts costs by the coordinated performance of tools and machines made to work together. Literature is available for the asking.

In 1946 the A.S.T.E. used this slogan as the Cleveland Show keynote . . . to describe the American Tool Engineer.

PRATT & WHITNEY
***Division* Niles-Bement-Pond Company**
West Hartford 1, Conn.

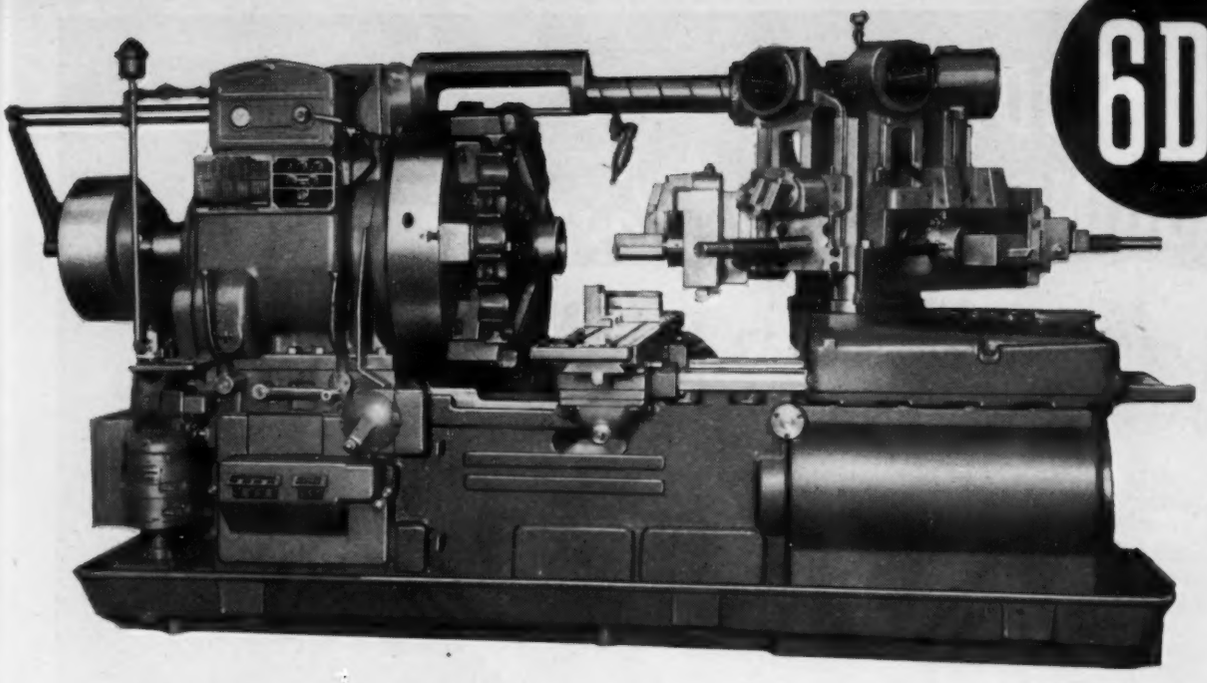


Even more than today, the car of tomorrow will be a product of better dies and molds. Increased knowledge of die design . . . improved coordinated tools by Pratt & Whitney . . . these make it possible to convert into metal and *mass produce* almost anything a designer can dream.

"There is no better-paying investment than the right tools for the job"

Pratt & Whitney
Die- and Mold-Making Equipment

Futuristic car, courtesy THE IRON AGE



INHERENT *power, rigidity, convenience and versatility in the* P&J 6DS AUTOMATIC TURRET LATHE *assure economy on a wide range of heavy work*

Large work as well as work that is irregular in shape can be handled at high production speeds on this P&J Automatic Turret Lathe. It can be tooled for an unusually wide range of work within its capacity . . . is powerful . . . rigid and because of convenience in control, imposes no unnecessary burden on the part of the operator. As a matter of fact, one operator can handle a battery of these machines without fatigue.

The P&J 6DS model has 4 automatic changes of spindle speed, 3 selective automatic changes of feed, automatic binding of turret following index, direct cross slide action and a motor driven constant rapid traverse motion to cross slide and turret slide.

P&J Methods Engineers are ready to cooperate with you in offering suggestions as to how you can cut costs in the machining of duplicate work, large or small.

CONDENSED SPECIFICATIONS

Swing over bed: 34" (Model 6DSE: 40")

Cross Slide Travel (each way 8½")

Turret Faces: 6

Turret Slide Travel 28"

OTHER P&J AUTOMATIC TURRET LATHES

Model 3U (Swing over cross slide: 9½")
Model 4D (Swing over bed: 21")
Model 5D (Swing over bed: 25")
Model 5D-2 (2-spindle Swing Limited by Spindle to Spindle Center Line Distance 10½"-15½")
Model 6DRE (Swing over bed: 34")
Model 8DT (Swing over bed: 36")

For more complete information send for catalogue 139.

POTTER & JOHNSTON COMPANY
PAWTUCKET, RHODE ISLAND
Subsidiary of
Pratt & Whitney
division Niles-Bement-Pond Company

P&J

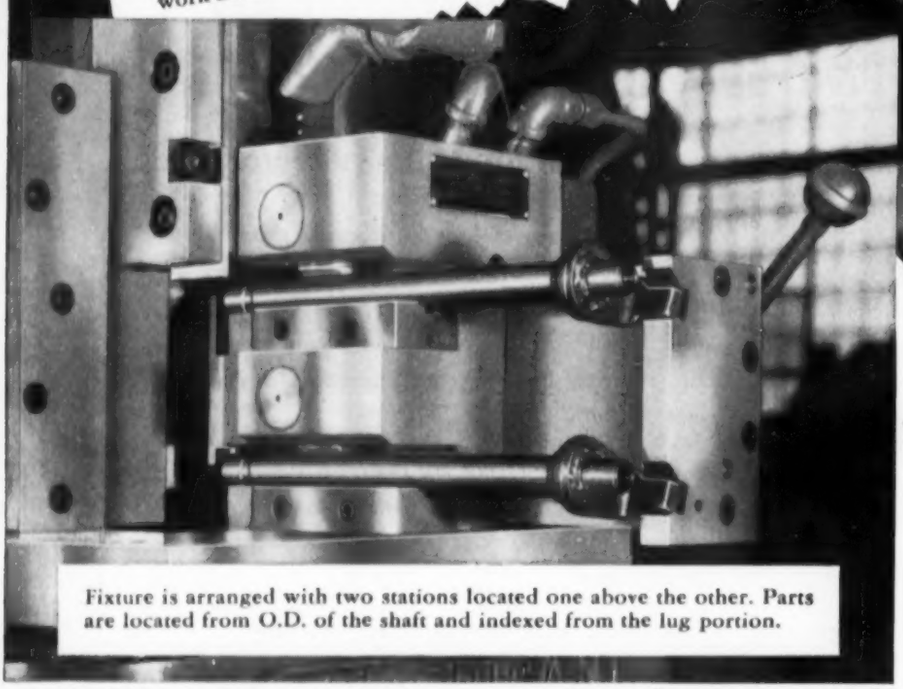
HIGH PRODUCTION BROACHING *At Low Cost*

WITH *American's* MANUALLY OPERATED V-2 12 TON PRESS

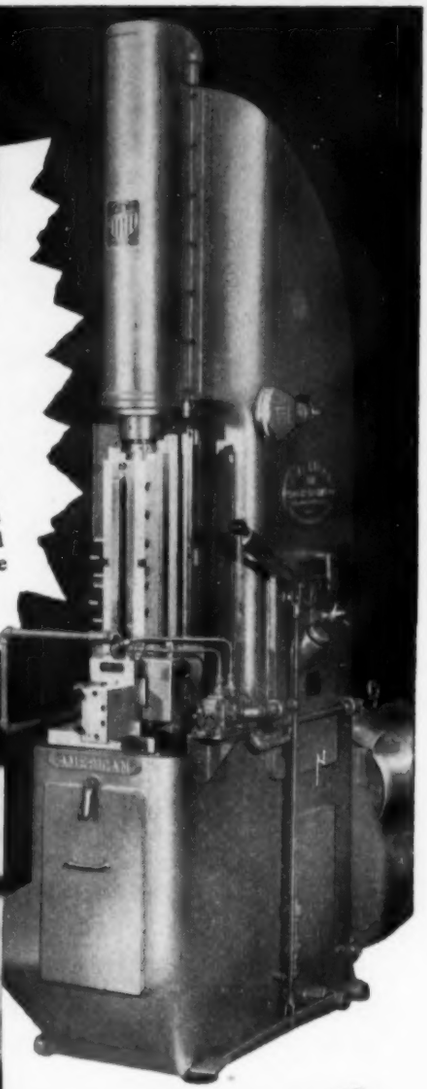
When you call in *American's* experienced broach engineers, high production broaching can be had at a surprisingly low investment. Their adaptation of the V-2 12 Ton Press (right) for broaching flats on automotive clutch pedal shaft assemblies is a typical example.

American engineers got the required production by tooling up the press with a simplified two-station work holding fixture, shown below.

In operation, two parts are loaded in fixture and clamped by independent hydraulic circuit. Machine cycle is started by hand lever or foot pedal. At end of stroke, ram stops in down position and operator unloads parts. Operator then returns ram to up position. Broach holders are hardened and ground, and guided in the fixture proper to give accurate alignment.



Fixture is arranged with two stations located one above the other. Parts are located from O.D. of the shaft and indexed from the lug portion.



In addition to the presses, *American* manufactures a complete line of broaching equipment: horizontal and vertical machines in various sizes and tonnages as well as standard and special broaches, push and pull heads, and work holding fixtures to meet the broaching requirements of the metal working industries.

Whether your broach requirements are similar to that shown or entirely different, *American's* experienced engineers will, on receipt of your blue print, recommend machine and tooling for the accurate and economical broaching of the required operation without obligation.

American is the one source for *all* your broaching needs—see *American* first.

Write for Free Circulars on *American* Presses

Free circulars on *American* V-1½ 4 Ton and V-2 6 and 12 Ton Presses are available on request. Write for your copies today. Ask for Circulars V-1½A and V-2A.

AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First—for the Best in Broaching Tools, Broaching Machines, Special Machinery

Easy to figure how CIMCOOL lowers metal cutting costs . . .

Cost figures show it in plant after plant. Cimcool—the revolutionary cutting fluid—this *chemical emulsion*—saves money three important ways.

1. **Longer Tool Life** (and therefore less down time) because of Cimcool's *chemical lubricity*.

2. **Faster Speeds** are possible because Cimcool cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.

3. **Cimcool Costs Less** than old-fashioned cutting fluids because it lasts longer in the machine and reduces the cost of cleaning and changing machines. It isn't subject to rancidity. Its low surface tension and low adhesion to work and chips virtually eliminates carry off.

CIMCOOL DIVISION OF THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO, U. S. A.

CIMCOOL *for* 85%

Trade Mark Reg. U.S. Pat. Off.

OF ALL METAL CUTTING JOBS

. . . and in Norristown, Pa.

FOSDICK *Sensitive* RADIALS

handle high speed sensitive jobs with radial drill flexibility

Fosdick Sensitive Radial operating at Welding Engineers, Inc., Norristown, Pa.

● To handle this job on a sensitive drill would have required a special fixture to turn the work. To have handled it on a standard radial it would have been entirely too slow. In either case the costs would be prohibitive for small lot operation.

That's where the Fosdick Sensitive Radial can save both time and costs. It will handle holes up to 1½" diameter and has been designed for drilling holes at various center distances at one setting of the work and where the number of pieces is small.

Note the design embodies an arm at fixed height an adjustable table in addition to the conventional base. The arm and table both swing in an arc of 360°.

The adjustable table enables operator to position the table correctly for any job.

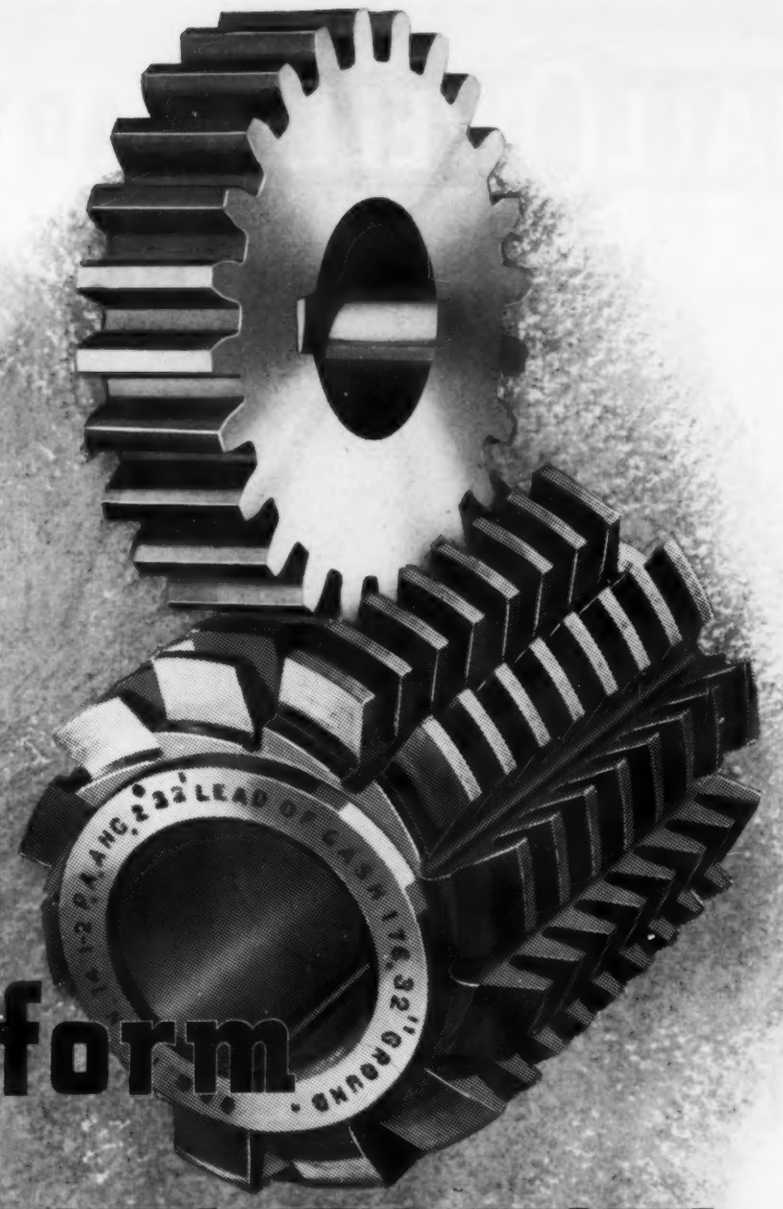
The head of simple design produces nine speeds and four speeds. Spindle speeds as low as 60 R.P.M. and as high as 3500 R.P.M. are available.

For a moderate investment this new Sensitive Radial is paying off in versatility—ease of operation and low costs.

Get all the facts. Write for Fosdick Sensitive Radial Bulletin. S.R.A.

FOSDICK MACHINE TOOL *Company*

CINCINNATI 23, OHIO



no other hob will outperform a UNION

See Catalog R
for various types of hobs

contact your local distributor

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

MILLING CUTTERS • GEAR CUTTERS • TWIST DRILLS • HOBS • REAMERS • CARBIDE TOOLS

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates.
BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers.
BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

HALLOWELL READY-MADE WORK BENCHES OF STEEL

FIG. 732
Pat. & Pats. Pending
Drawer is extra

...CAN BE BOLTED TOGETHER TO FORM A *continuous* WORK BENCH

The serviceable, ready-made "Hallowell" Work Benches of Steel are ideal equipment for modern shops. "Hallowell" Benches have smooth, long-wearing steel tops, are also available with heavy, high-grade laminated wood tops—or steel tops covered with "Tempered Presdwood". Made in 4 standard heights, 3 widths and 7 lengths, these "Hallowell" units can be used either individually or bolted together to form a continuous work bench—most any length—a money-saving feature *not practicable* with *"nailed-together"* wooden benches. The "Hallowell"—rigid as a rock—*does not* require costly bolting to the floor.

Write us for the name and address of your nearest "Hallowell" Industrial Distributor and your copy of the "Hallowell" Catalog.

OVER 45 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNSYLVANIA BOX 4

BRANCHES: CHICAGO DETROIT ST. LOUIS SAN FRANCISCO

CLEVELAND

PRESSES
FOR LONGER DIE LIFE

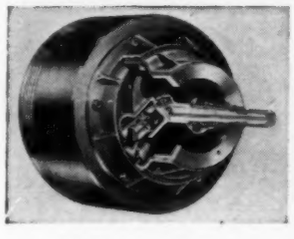
Modern "Cleveland" Presses have the gearing located in the box-type crown with the drive unit, eliminating overhanging brackets. This allows a more rugged type construction and reduces overall dimensions, saving valuable floor space. "Cleveland" Four-Point Presses have one connection at each corner of the slide. This arrangement plus extra-long bearing surfaces prevents the slide from tilting whether work is centered or not. Perfect alignment between the face of the slide and the bed is always maintained. There is little possibility of the dies overlapping. Not only is the life of the dies extended but constant accuracy is assured.

If you require unusual capacities, a Modern "Cleveland" Press can be made to your specifications. For more information on "Cleveland" Presses, address inquiries to Department 4 A.M.

MODEL 4S-315-84-60

Stroke	18"
Adjustment	18"
Shut Height	54"
Strokes, per minute	15
Bed Area, F to B X R to L	60"x84"
Capacity	315 tons

CUT OPERATING COST



Use the
CLEVELAND (PAT.) DRUM TYPE FRICTION CLUTCH & BRAKE

Self Adjusting . . . ¼ the usual weight . . . ½ the usual parts . . . . Readily Serviceable . . . . Quicker Starting & Stopping . . . Always Full Clutch or Full Brake . . . More Dependable

THE CLEVELAND PUNCH & SHEAR WORKS CO.
U.S.A.

PUNCHING TOOLS & DIES

OFFICES AT
NEW YORK . . . . CHICAGO
DETROIT . . . . PHILADELPHIA
PITTSBURGH

Established 1880

FABRICATING TOOLS

CLEVELAND 14, OHIO

• • • • • POWER PRESSES • • • • •

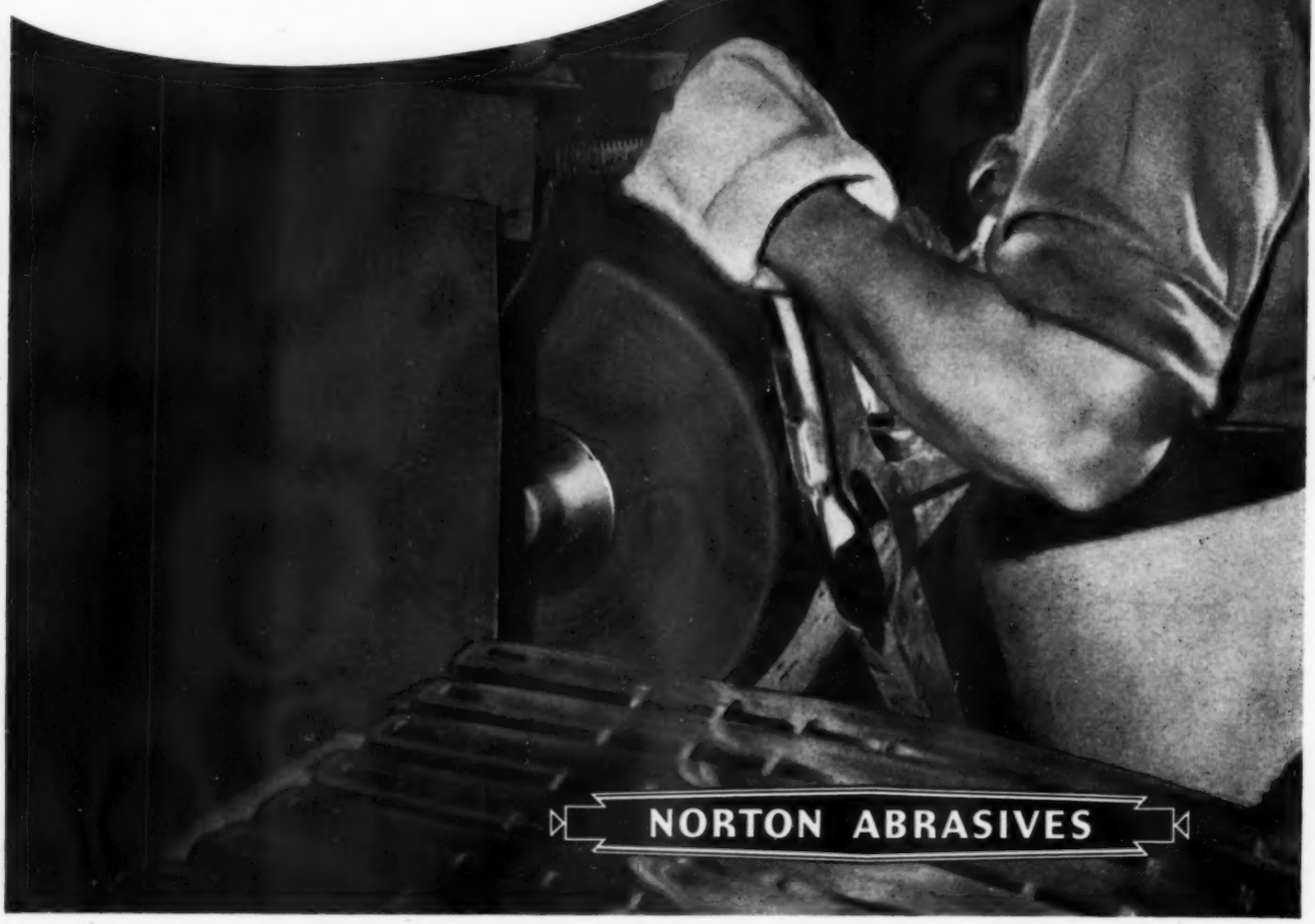
You Can Polish Faster and Better with ALUNDUM ABRASIVE

—BECAUSE Alundum Abrasive for polishing is carefully prepared for just that purpose. At the Norton electric furnace plant it is given the correct physical and chemical properties. Then at the Norton Worcester plant, it is crushed to the right grain sizes for polishing work and is given special surface treatments which make the grains "friendly" to adhesives. They stay on the wheel head 'til the job is done!

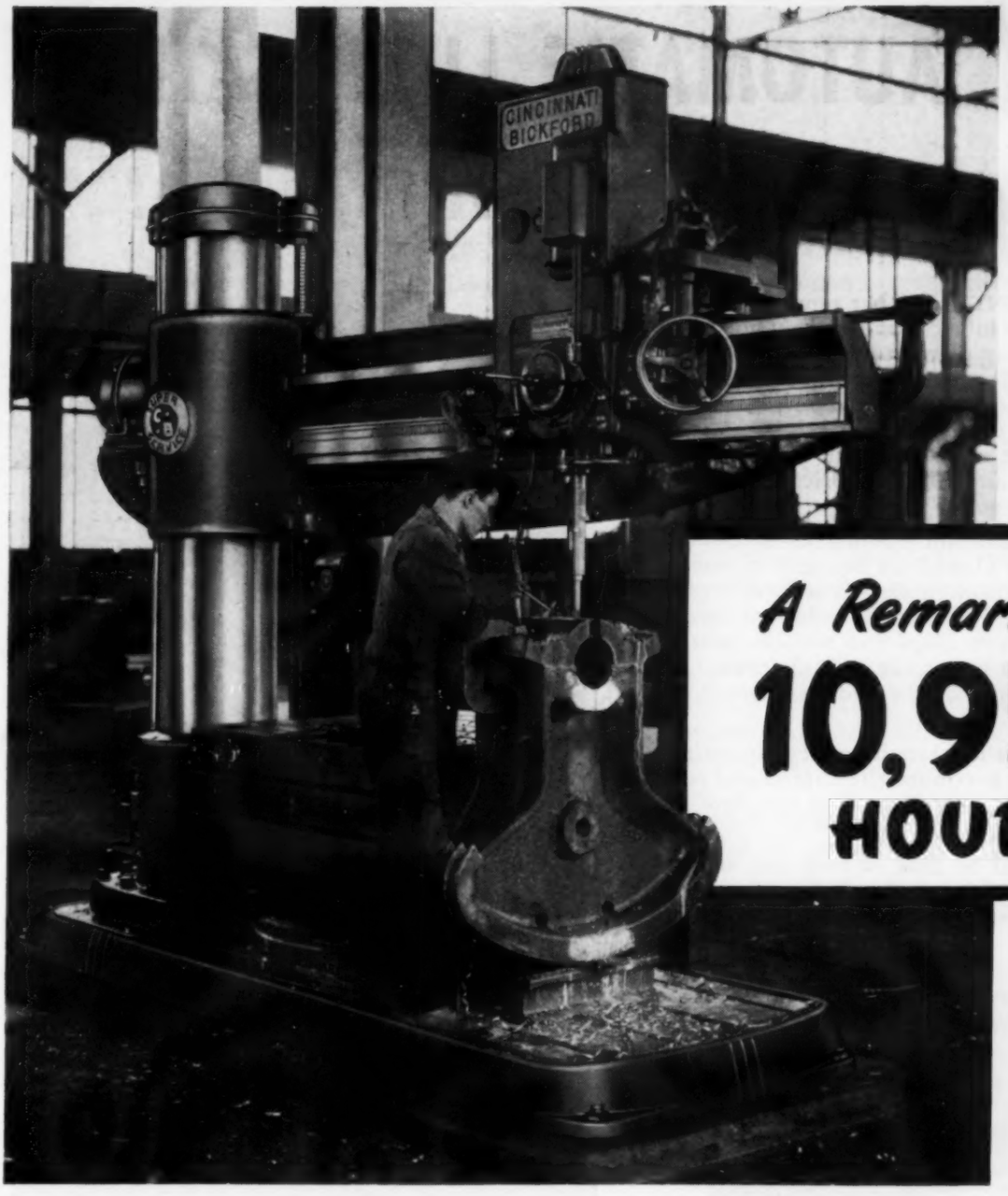
For helpful polishing information and full details on cost-cutting Alundum Abrasive, write for a free copy of the new booklet "Setting-up Metal Polishing Wheels and Belts."

NORTON COMPANY WORCESTER 6, MASS.

Distributors in All Principal Cities



NORTON ABRASIVES



A Remarkable 10,950 HOURS

Perhaps the greatest test of both materials and workmanship in a machine is the test of uninterrupted production.

A Cincinnati Bickford Super Service Radial Drill was on a 24-hour schedule for 15 months at the Pittsburgh Steel Foundry, Glassport, Pa.

They tell us that the operators of this machine were not highly skilled but, due to the extreme simplicity of operation, did a fine job—and maintenance cost was zero over this period.

For durability, easy of operation and high production, use a Bickford Super Service Radial Drill.

Write for Bulletin R-24A.

THE CINCINNATI BICKFORD TOOL CO.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radials 7½" dia. col., 2½" arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9. Ohio U.S.A.

DANLY AUTOMATIC LUBRICATION

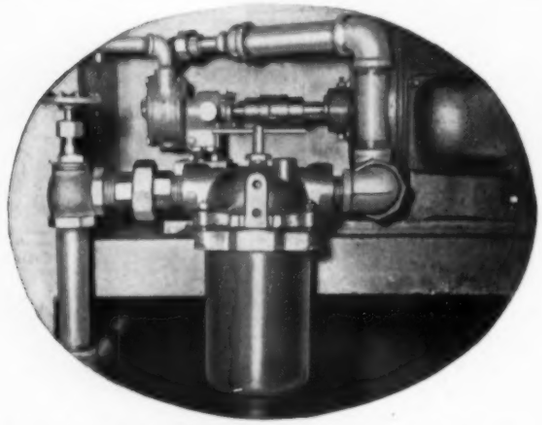
Saves Man Hours on the Job!

THE HUMAN ELEMENT is all but removed from the important job of lubrication in Danly presses. Clean, filtered oil is pump-driven to every gear, bearing and driving member in the crown and slide *including the flywheel bearings.* Consequently, frequent manual lubrication of the flywheel bearings at the top of the press is not necessary. The Danly press does not require daily attention to lubrication. This feature saves *man hours on the job.*

There are other important advantages of Danly lubrication. Constantly filtered oil brought to every point requiring lubrication, materially reduces wear on gears and bearings. The lapping action on these gears, which occurs when chips and metallic particles accumulate, cannot happen in a Danly press. A filter, located at the side of the bed, removes any foreign material.

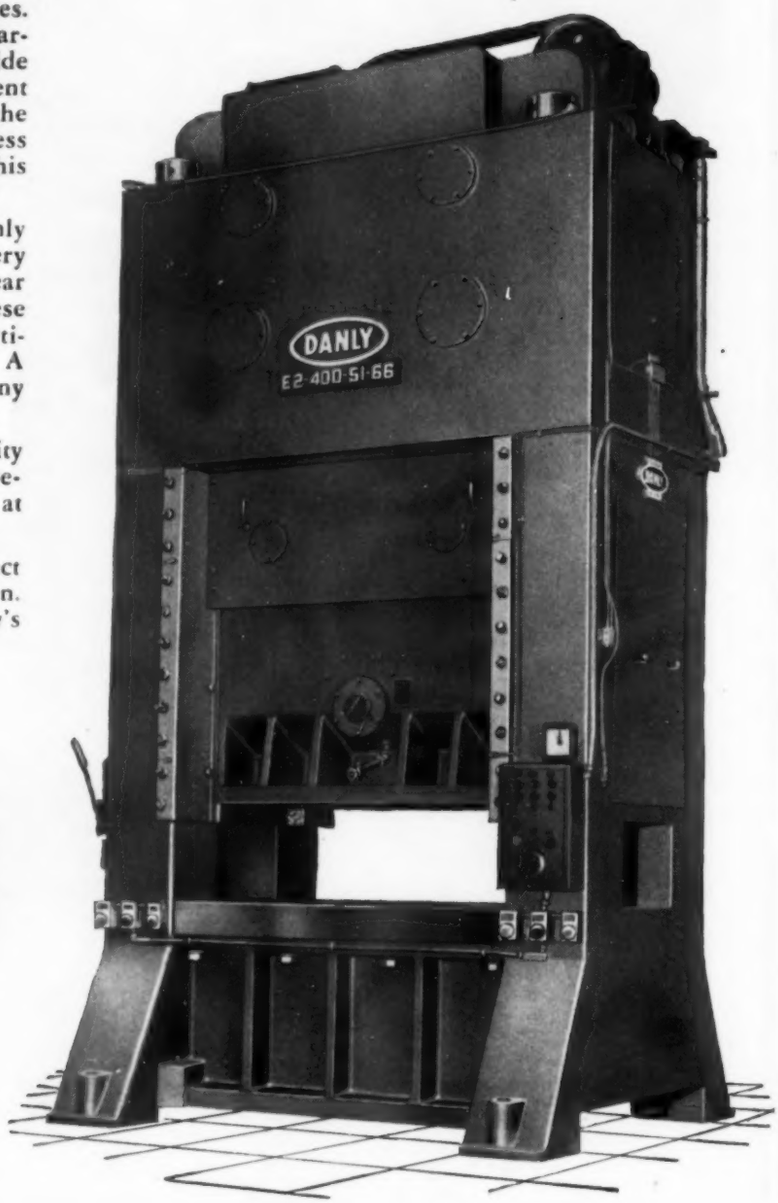
The Danly press does not require a large quantity of oil since the supply is continually filtered and reused. Thus, there is no excessive oil to overflow at any point.

Danly Engineers will be glad to help you select the most efficient press for your kind of production. Send drawings, specifications, or parts to Danly's Press Sales Division.



PUMP-DRIVEN LUBRICATION TO ALL GEARS AND BEARINGS IN THE CROWN AND SLIDE—INCLUDING FLYWHEEL BEARINGS

This is the motor, pump, and filter unit, generally installed at the right-hand side of the bed, which supplies the proper quantity of clean, filtered oil to the driving members of the Danly Press.



DANLY

DANLY MACHINE SPECIALTIES, INC.

2100 SOUTH 52ND AVENUE CHICAGO 50, ILLINOIS

25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

PRECISION DIE SETS...STANDARD AND SPECIAL • MECHANICAL PRESSES AND PRESS EQUIPMENT

SPOT NEWS OF METALWORKING

Ford is experimenting with radioactive isotopes of cobalt and selenium for inspecting and controlling blast furnace operation. For inspection, the isotopes are more powerful than the X-ray. They indicate the level of molten iron in the furnace.

Steel die-castings, long desired because of accuracy and minimum of machining, are now being produced on a new injection molding machine. The metal is melted in an induction furnace. The injection cylinder is carbide-lined.

Sheet aluminum is used almost entirely for body of some new General Motors buses, saving 200 lb. in weight. General Motors Truck and Bus Division is working on a 250-hp. diesel engine made of aluminum. Weight saving is expected to total 1800 lb. Cylinders will be sleeved with a ferrous liner. Bearing caps will be of cast iron.

New automatic machine for cutting slots in screw heads, using a carbide saw, has been developed by a Detroit company. Production is stepped up from 30,000 to 80,000 pieces per day compared with the former process.

Note on featherbedding: large manufacturer of consumer durable goods estimates it is employing 1150 more workers than it should if its people did a fair day's work.

Smaller, lighter-weight cars are getting a lot of attention from automotive development engineers and designers. One proposed car weighs less than 1000 lb., resembles some of the small British cars, falls midway between the new Ford and the Crosley in size. A small motor for a light car is now in the development stage, too.

Equipment for new French continuous strip steel mill at Hayange probably will be supplied by United Engineering, E. W. Bliss and Westinghouse. France hopes to export 300,000 tons of strip a year by 1952.

Fifty U. S. manufacturers are negotiating with British government to establish factories in Britain. About half involve extensions of existing operations, 20 are firms which have British sales offices but no production facilities, and five have not operated in Britain at all. So far, only nine companies have applied to ECA to underwrite their planned new investments in Britain.

Curbs on secondary boycotts and on jurisdictional strikes are likely to be carried over from the Taft-Hartley law to any new law passed next year. Some method for coping with national emergency disputes also will be included. Arbitration may be provided for contract violations and for disputes over the meaning of a contract.

A new machine to compress the 12 engine valve springs and retainer washers and insert the locks at one operation has been developed by Plymouth. This has always been a one-at-a-time job and difficult.

Gaging Metalworking

Machine tool builders have heard a lot about the defense and ECA business that they are to get, but up to now it has amounted to little more than talk. Relatively few companies have yet received orders from the aircraft engine program. A considerable volume of business should come out of the Westinghouse engine tooling program, but no one knows how soon it is likely to break.

▸ Scarcely ever have inquiries for machine tools been heavier. But the process of converting a reasonable percentage of these inquiries into orders appears stickier than usual. Some buyers are inclined to wait and see what national legislation may be before embarking on further machine tool purchases.

▸ The fact that automobile companies next year will begin reverting to their old practice of making annual model changes is an encouraging long-term factor for machine tool builders. On the other hand, such changes must incorporate engine and other mechanical changes as well as body alterations to mean much in new business to the machine tool industry.

More Steel Expected in 1949

Users are scrambling for steel harder than ever. Some expect to get more tonnage next year than this year. One major automobile maker, for example, seems confident of 10% more. Few big customers look for less shipments in 1949.

▸ Low carbon sheet and strip continue in steady demand, with no signs of easing. Important consumers anticipate the need for at least as much steel next year as in 1948.

Stainless Steel Demand Rises

Certain steel users say that they have obtained as much as 15% of their tonnage this year by conversion deals. Others intimate that the proportion has been even higher. The truth is that conversions are getting harder to secure; and the final cost to the fabricator is mounting. The growing cost is partly traceable to the freight rates involved in shunting the steel from one place to another to have various operations done on it.

▸ Stainless steel has perked up. Demand is so heavy that mills are loaded for a full three months ahead.

Steel plates probably are the worst item. That is because more than one-third of all available tonnage is under government allocation. Tanker and barge work is likely to take even a larger ratio as the program expands. Tightness in plates has led inevitably to many conversion deals. Well over 25% of all plates are now being obtained through the conversion channels.

No Improvement in Copper

Copper remains one of the most critical items, and little improvement is anticipated for some time. The situation is aggravated by two factors: 1) shutdown of the largest domestic mine because of labor trouble, and 2) expanding requirements for the government's stockpile. These two developments alone have slashed the available supply more than one-third.

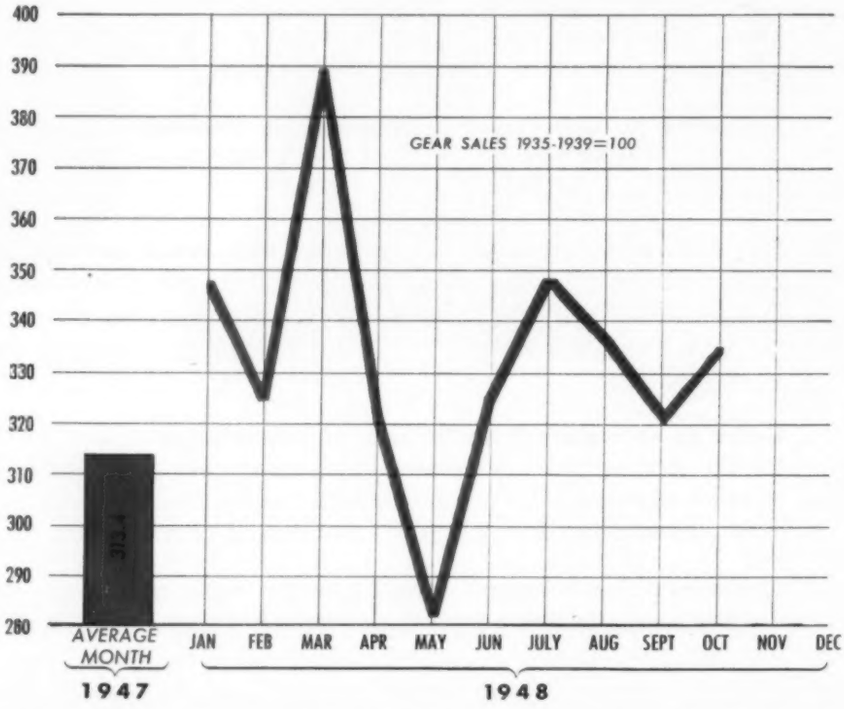
Despite the seriousness of things, some big users have cautioned their plants not to build up their inventories of copper. They have suggested that the supply on hand at plants be kept as much as possible in the form of raw materials rather than as fabricated parts, so it can be switched to production on whatever parts are needed immediately.

▸ Brass mills now are accepting only orders which can be shipped within 60 days. These orders are subject to prices and terms prevailing on the date of shipment. Most mills are in a position to make shipments within four to six weeks.

Premiums Paid For Lead

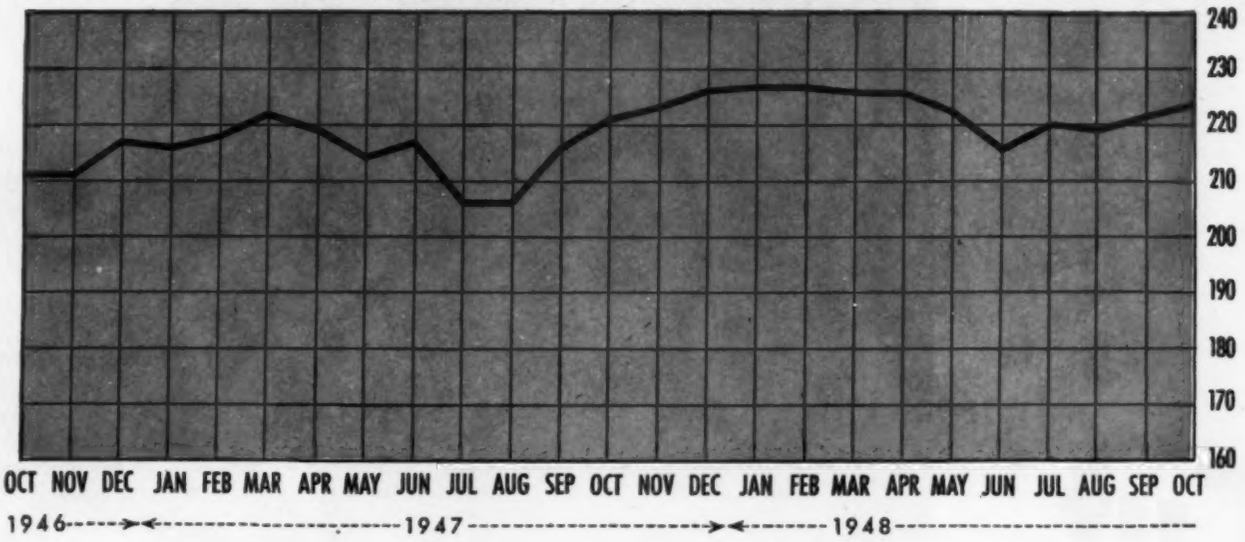
Lead users are resorting to paying substantial premiums for foreign and secondary material to get enough to operate. The recent increase of 2 cents per lb. was supposed to bring out an increased supply of both primary and secondary materials.

Production of zinc is on the upgrade. The supply, however, is very



***GEAR SALES** advanced in October 4.03% over September, according to the AGMA index which touched 333.3. The September figure was 320.4.*

American Machinist INDEX OF METALWORKING PRODUCTION



INDEX		COMPONENTS				
		MACHINERY	ELECTRICAL MFG.	AUTOS, TRUCKS	TRANS-PORTATION EQUIP.	OTHER METAL-WORKING
Oct. 1948.....	223	250	235	223	311	155
Sept. 1948.....	222	249	231	227	308	154
Oct. 1947.....	221	243	240	227	284	151

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1 Index figures are a percentage of 1939, which equals 100.

tight. Demand is high and no relief is looked for until the second quarter of next year.

▸ Aluminum is about in the same spot that it has been, except that it promises to get worse. Production delays are looming in users' plants because of the shortage of aluminum. The larger consumers are keeping a close eye on their needs and are putting the heat on mills whenever deliveries appear to be falling off.

Tool and Die Shops Need Work

Contract tool and die shops, not doing so well just now, are hoping for some measure of recovery after the turn of the year. Present backlogs are barely enough to keep the companies operating at a reasonable level. Any further reduction will make necessary either a shortening of hours worked or a slash in the working forces.

The number of men on direct labor in tool and die shops has slipped gradually all year. In certain cases owners of small shops doing simple and easy work are taking jobs at concessions to hold their employees together. Prices, however, are reported firm on the bigger and more complicated jobs.

Drop Forge People Busy

Drop forge companies still are doing a big business compared with prewar. The dollar volume in many instances is three to four times the 1939 total. Orders on the books currently should keep the industry busy for about four months.

▸ Competition for existing business is said to be unusually keen in the screw machine products field.

▸ Foundry equipment manufacturers are eating into their backlogs. Nevertheless, the amount of work at hand is sufficient to guarantee good production for many months ahead.

Bearing Backlogs Slashed

Anti - friction bearing industry backlogs have declined by more than 50% since the beginning of 1947. Currently, four-months' production is represented.

▸ Industry sales are at a level almost three times that of the top prewar year of 1937. Domestic shipments fell off in 1947, but were more than offset by an increase in foreign shipments which rose from $4 million in the first quarter of 1947 to $9 million in the first quarter of 1948. Future foreign demand depends largely on the nature and extent of ECA and other government aid.

▸ New capital expansion in the industry is largely completed. There was considerable expansion during the war and this, plus postwar additions, has given the industry a capacity increase over prewar years greater than the 52% increase for all manufacturing. Further capacity increases will result from replacement and modernization of existing facilities.

In some industries, such as aircraft and diesel locomotives, antifriction bearing requirements are expected to move upward. Some decline is in prospect in other industries that have completed postwar expansion programs. However, antifriction bearing shipments in the near future should be close to current levels.

Screw Machine Products Up

New orders to the screw machine products industry touched the highest point in October since February of 1947. The new order index (1940 = 100) rose to 268, an increase of 70 points over the September figure. Invoiced sales, as shown by the index mounted in October approximately 5 percent.

Cut Your metal cutting costs

Use Texaco cutting coolants for faster machining, finer finish, fewer rejects

DRILLING, grinding, milling, turning — whatever the metal or machining method — there is a top-quality *Texaco Cutting, Grinding or Soluble Oil* to help you do every metal cutting job in your plant faster, better, and at minimum cost.

Texaco Cutting, Grinding and Soluble Oils lubricate effectively. They keep tool and work cool — prevent chip welding or wheel loading. They prolong tool life, assure cleaner cuts and smoother finish, increase production and lower costs wherever they are used.

A Texaco Lubrication Engineer who specializes in cutting coolants will gladly help you select — and use effectively — the Texaco cutting coolants you need for best results.

Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

Tune in . . . TEXACO STAR THEATRE presents MILTON BERLE every Wednesday night. METROPOLITAN OPERA broadcasts every Saturday afternoon.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Working at the Ward Level

Management should take lessons in certain respects from the politicians if it wishes to sell itself to its own community.

Politicians know exactly where votes come from. The votes are at the ward level. They go even farther down, because the ward is divided into precincts.

The politicians figure it this way: the more a candidate can sell himself to the rank and file in the ward, the surer he is of rolling up a big vote.

Personal appearances are important for the candidate. The better the people know him, the greater the chance that they will like him, be familiar with what he stands for, and vote for him on election day.

These simple facts should be adapted by management to its own constructive uses.

The president of one large metalworking company has done something with them the past two years.

His company operates in four communities. He has made frank reports in popular printed form to employees on the company's activities and financial status. Beyond that, he has carried the company's message to neighbors of his employees and to other townspeople in town meetings held in high school auditoriums and other suitable places.

He has not offered entertainment or free food or free drinks as bait. He has stuck strictly to the task at hand—informing the people about his company's business. And the auditoriums have been packed.

He has done the job himself, with assistance from his associates. After telling the company's story, he has invited questions of all kinds.

Other methods also are used to try to acquaint the community with what the company is doing. For one thing, plant Open Houses are held. The president plans to expand the program next year. He wants still more of the townspeople to know about the company. He is confident that if they have the facts, they will be his and the company's friends.

Asked the cost of his program, he replied, "It is much more to the point to raise the question of what it will cost us if we do not carry through with this program."

Perhaps it is significant that since the program began two years ago, the number of worker grievances has been cut to one-third its former volume.

A long and lusty cheer for this company and its president. He does not try to drive home with a sledgehammer the benefits of free enterprise. By telling them the facts about the company, he lets the townspeople find out for themselves.

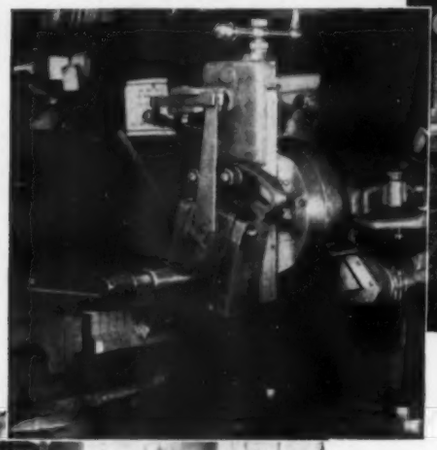
He recognizes that there is no substitute for himself in doing this all-important community job. He cannot afford to delegate it to the fourth echelon.

What is more, he has gone "to the ward level" with his story.

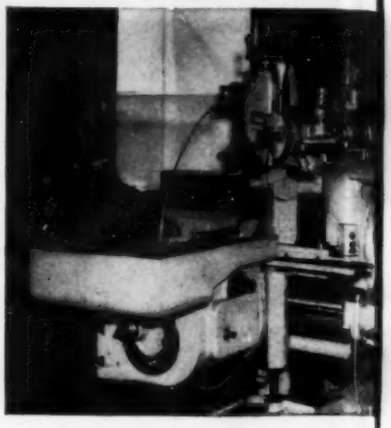
Burnham Finney

EDITOR

Power down feed speeds vertical facing and slotting.



The Cincinnati automatic tool lifter is essential for carbide tools and high speeds.



Supplementary table top for extra large clamping space

Auxiliary front cross feed is very helpful for developing contours.

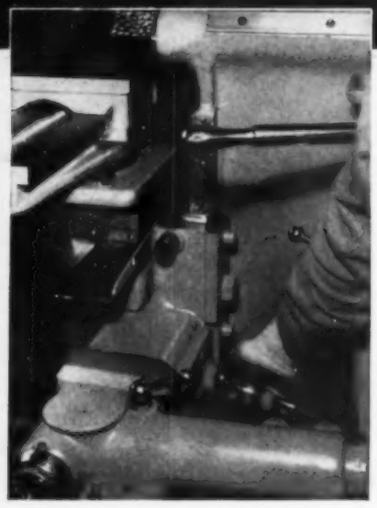
FAST SHAPING

...and wide utility, too!

Powerful Cincinnati Shapers are tailored to your needs—the many features available to you will both speed your job and widen the use of a shaper in your shop.

Cincinnati Shapers are accurate, speedy and versatile. They are the handy man of industry.

Write for Catalog N-3, describing the many features and many types of Cincinnati Shapers available to you.



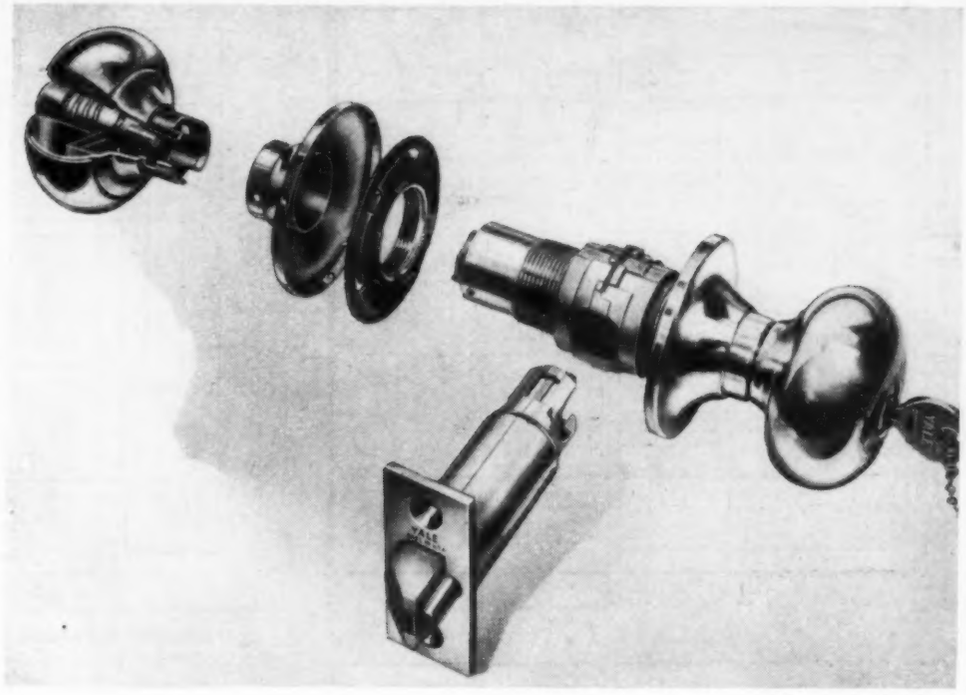
Power elevation to the rail, with all controls convenient to the operator, reduces setup time.

A Cincinnati Shaper with universal table is especially useful for tool room and die work.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES



Tubular-lock assembly has exposed parts made from stamped, forged, and extruded brass. Most of the remaining parts are zinc-base die-castings

PRECISION DIES MASS-PRODUCE DIE-CASTINGS

BY HAROLD E. NAGLE, GENERAL SUPERINTENDENT, STAMFORD DIV., THE YALE & TOWNE MFG. CO.

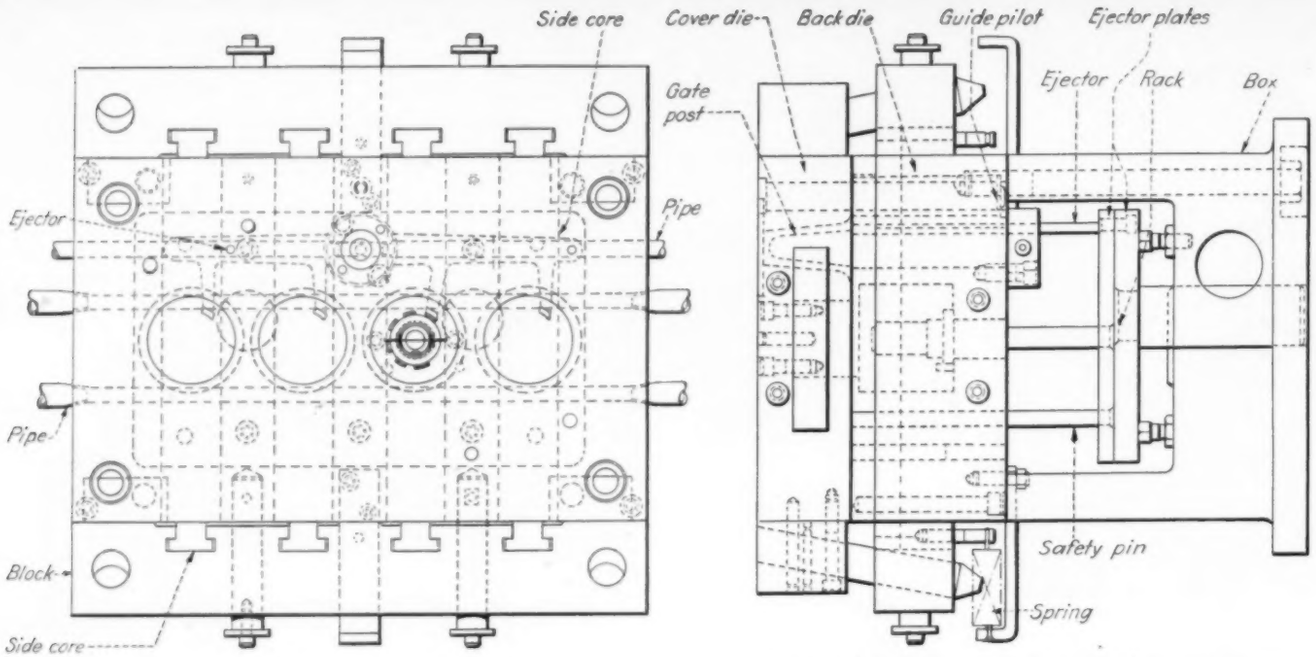
Inserted dies in multiple cavities and movable side cores make possible zinc die-castings for internal lock parts that require little machining

IN THE highly competitive field of lock manufacture, no new design can hope to attain commercial success unless it is well adapted to economical quantity production. This means that components must be capable of manufacture by high-production processes such as stamping, die-casting, die-forging, and screw-machining. Best results are attained when these items come from the basic machine in such shape that a minimum of added machine work is needed and assembly is simple.

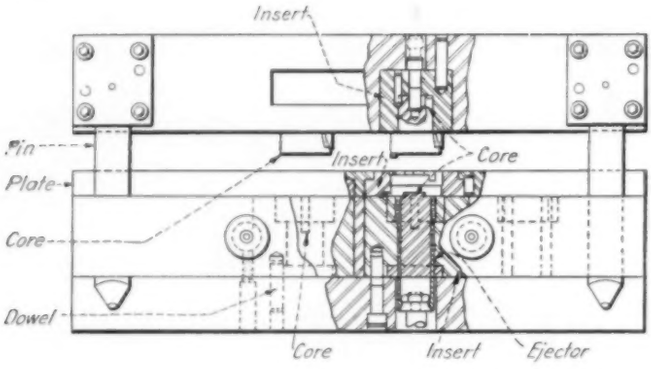
To accomplish these results, and still provide an assembly of high quality, requires top-notch tool engineering. Parts must come from the dies with dimensions held within close limits and with a degree of smoothness that insures good appearance without excessive polishing and buffing. Parts that mate must fit together properly and, where working clearances are needed, the fit must be neither too tight nor too loose.

The lock illustrated is a tubular Yale heavy-duty type, in which the trade demands that all exposed elements be either brass or bronze. This applies to both knobs and to both the inside and the outside rose (all of which are stampings), to the lock cylinder, plug-latch bolt and dead-lock bolt (all made from extrusions), and to the forged front plate through which the bolt operates. Custom also demands a brass or bronze hub, which is the cam-like element that operates the bolt, and which is also forged.

Most of the other major components, as well as several small parts, are zinc die-castings, all of these being either inside the door or otherwise concealed within the assembly. Without these castings, in fact, a lock of this general design would be either a commercial impossibility, or (what amounts to the same thing) would involve a far greater ex-



Tubular housings, two inner and two outer, are die-cast in this four-cavity die. Two slides per cavity make it possible to cast the external threads



penditure in tooling or machining, or both.

By die-casting it is possible to produce parts of odd shape or contour and to hold their critical dimensions, as cast, within remarkably close dimensions, yet to keep their cost low. Most holes in these castings are cored and, where the castings mate, some fits are held so close, *as cast*, that slight differences in the thickness of the copper plating (measured in tenths of thousandths) must be considered.

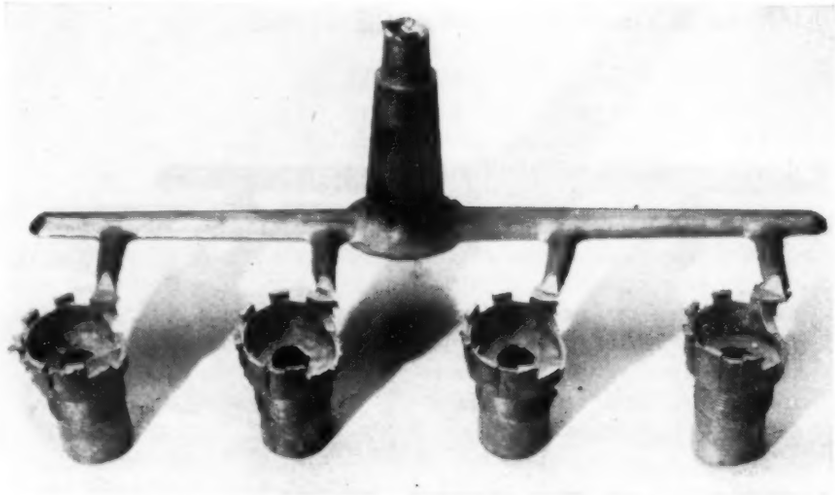
Naturally, it requires good dies to hold die-castings to dimensional limits so close, but years of experience in making die-cast lock parts enables Yale & Towne to secure and to maintain the necessary precision. All of the die-castings are produced in multiple-cavity dies and this helps to promote economy in their manufacture.

Some idea as to the die-castings used and how they fit into the assembly can be had by reference to the exploded view of the lock.

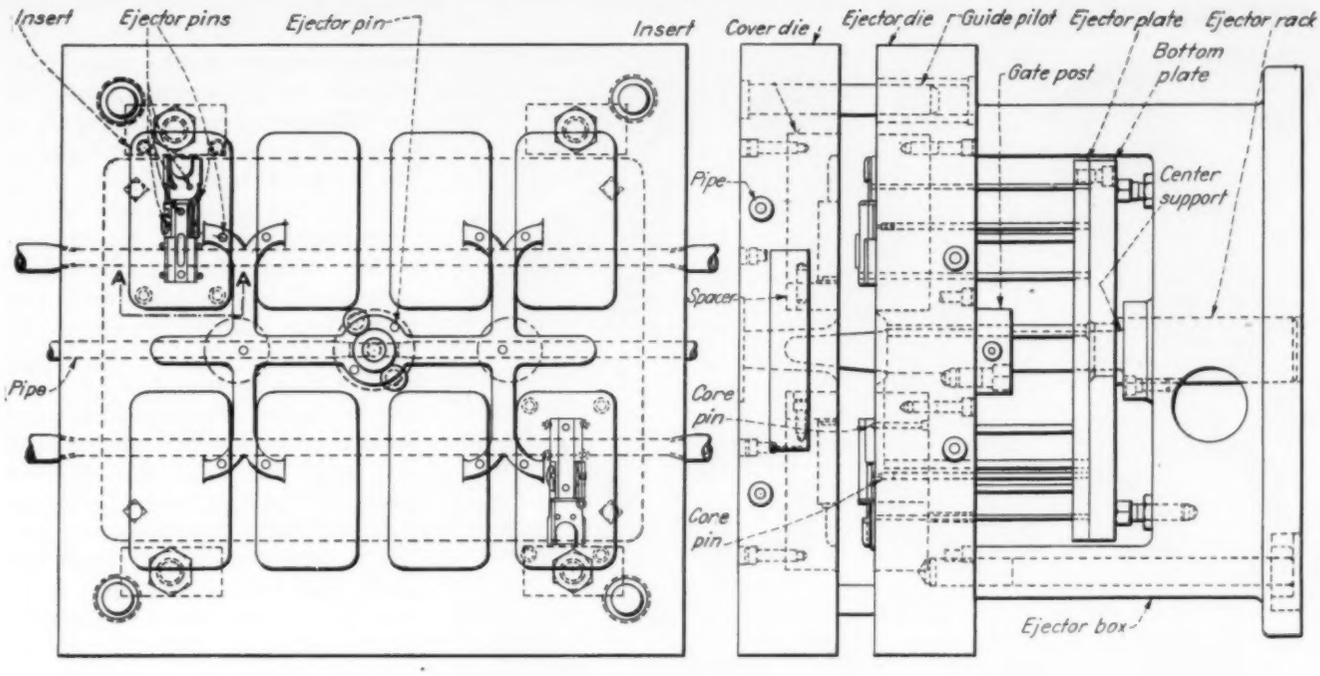
Assemblies are made in several different combinations to meet varying requirements but that illustrated contains 16 different die castings and more than one of some of these castings enter into each lock assembly.

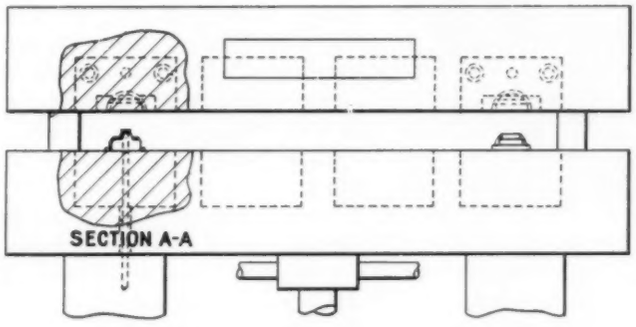
Two major castings which form the tubular body have serrated inner ends that provide on each piece six jaws that mesh like the jaws of a positive clutch. The fit between jaws is so good, as cast, that when the jaws mesh there is no angular shake. Each jaw fits a mating groove and, when jaws mesh, the two parts are fastened together by a spring-wire three-quarter ring that locks the two parts in true axial alignment.

The two halves are similar, though not identical, and are made in a die with two cavities for each

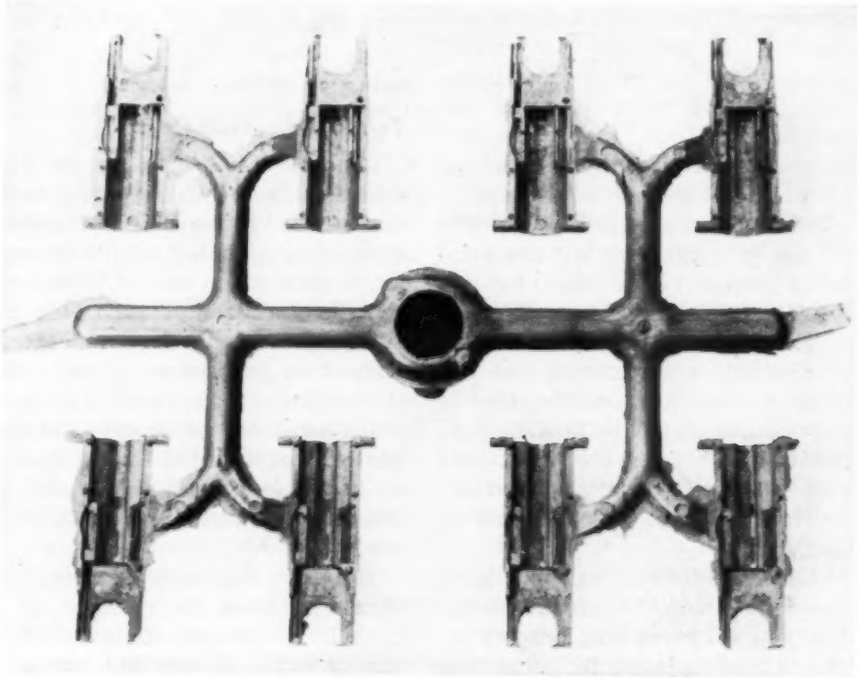


Gate of four tubular housings cast in the die above. Teeth mesh so closely, as cast and plated, that perfect alignment and zero angular clearance are attained when the halves are assembled





Eight half-case castings are produced in this die. Dowel pins cast on one half fit mating cored holes on other half to insure positive relative location



Gate of eight castings produced in die above. Removing flash, drilling one hole not readily cored, and plating make the parts ready for assembly

half. This die is parted in a plane at the bottom of the serrations. This brings flash at a point where, if not perfectly trimmed, it cannot affect the fit between jaws. Projections from the cover portion enter recesses in the ejector portion to form the serrations and the opening where both housings subsequently fit. There are also axial core pins in each half and on two of these there are projections that produce arc-shaped slots through the flange joining the larger and smaller diameters.

As the external thread below the flange is cast, it is necessary to provide a slide at each side of each cavity, the ends of these slides form the thread and clear it when withdrawn by angle pins, before the tubular ejectors push the castings out of the die. Castings are so well formed that almost no machining other than flash removal is needed, though threads probably will need chasing to get rid of the parting line after dies begin to wear. In this, as in other dies, the cavity blocks are made separately and inserted in the die body. This facilitates hardening and repairs, when needed.

Four castings of each half of the bolt housing are produced in an eight-cavity die. The die is simple in the sense that it requires no slides or movable cores, but the fixed cores on the ejector half form recesses that are complex and pro-

Smaller die-cast parts include: *a* tubular spindle guides, *b* yoke for bolt assembly, *c* cups serving as spring seats, *d* pushbutton body, *e* pushbutton plunger, *f* slotted parts with face cams on rear end (one including a pin clinched in a cup recess after casting), and *g* other small castings

vide precisely formed seats for mating elements. Since the housing must hold the other elements in correct relative position, the need for close dimensions, as cast, is apparent.

It is clear also that the two half housings could not be produced except as die-castings. If the complex recesses had to be machined, costs would be prohibitive. The halves are nearly but not quite identical. One half has five integrally cast dowel pins, four of which are conical and one cylindrical. These pins fit mating cored holes in the other half and, at assembly, assure perfect alignment. Outer faces each have arc-shape cored recesses by which the assembled bolt housing is locked into the tubular assembly.

Next smaller in size than the castings already dealt with are parts termed spindle guides. These castings are tubular in general shape but have cored axial holes that fit the square spindle as well as square, cored crossholes, the latter necessitating a movable core coming in from each side. These die-castings also have external projections and the axial cores are not square throughout their length but include key-like projections and stepped cylindrical portions. Only two of these castings are needed per lock, but there are three different designs all of which are produced in a six-cavity die.

Side cores are operated by blocks moved by angle pins but the axial cores remain fixed and tubular ejectors are used. Although some of the square holes require machining and some turning and slot milling operations are required to provide undercuts in keylike projections, all cuts are light and rapidly made at low cost and the finished castings are also low in cost.

All other die-castings that enter the lock assembly are comparatively small parts but, in some respects, are no less interesting than the larger parts. The very fact that these parts are small and have irregular shapes makes them well adapted to die-casting, even in multiple-cavity dies. Most of them could not be made economically in the shape desired and with most critical dimensions cast within close limits except by die-casting.

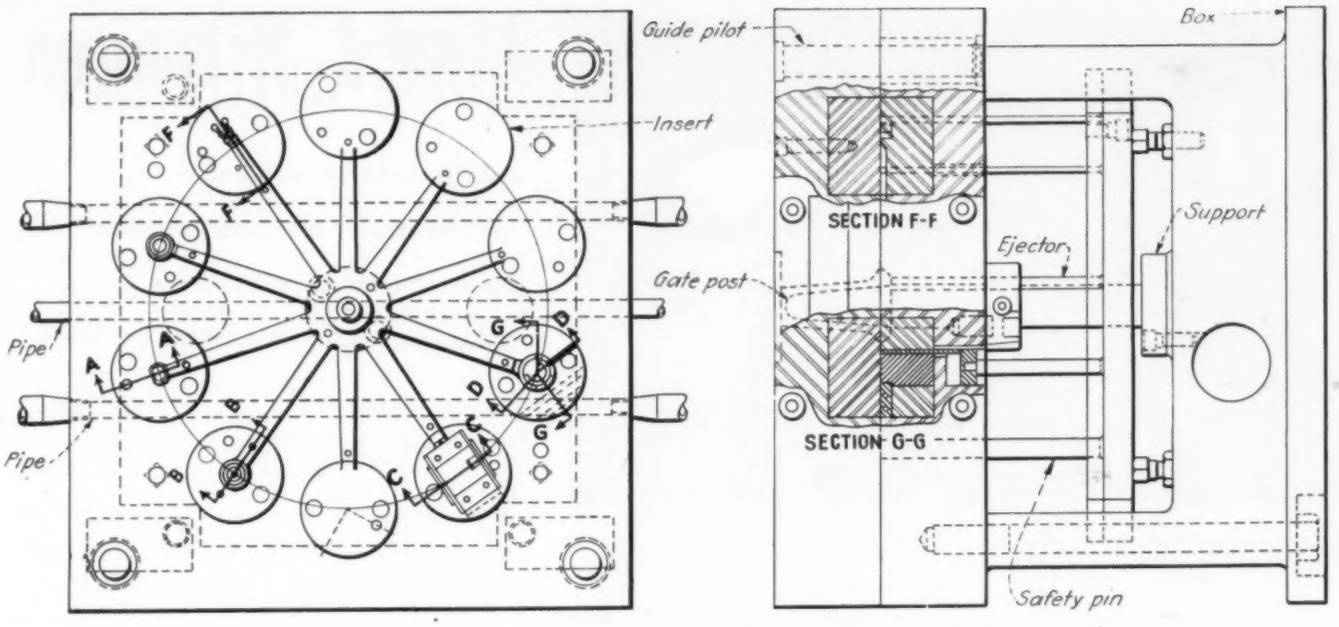
Most interesting of the small parts are the pushbutton body and pushbutton plunger, made in an eight-impression die. The body casting may be described as a hollow "cylinder" flattened inside and outside and provided with a head and solid shank at one end. A fixed core in the cover die forms the axial hole, but there are also two cored side holes 90° apart and these require movable side cores. For this reason, the four cavities that produce the body casting are placed near the corners of the die block. One core per cavity produces an oblong hole in one flat face and the second core produces, in one crowned face, a slot parallel to the axis and a cross slot.

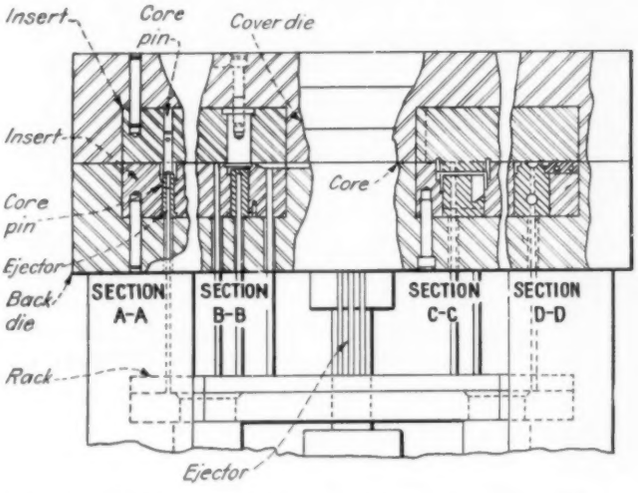
Four remaining cavities in this die produce pushbuttons that have a cylindrical head and a shank flattened on two opposed faces and crowned on the other two. Fixed cores form a slot through the axis, the slot cutting through one crowned face of the shank. This slot is not of uniform section but has side recesses that necessitate coring from both ends. On one flat face, there is an external cross slot that constitutes an undercut and hence must be formed by a movable side core.

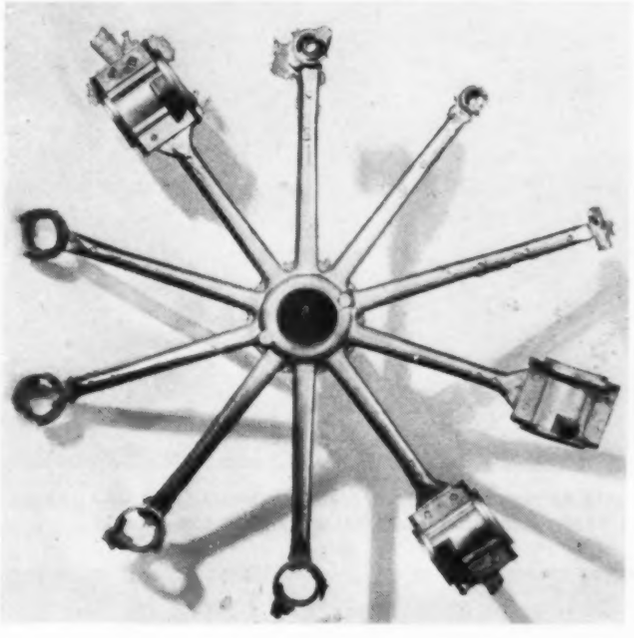
Twelve Movable Cores

Thus, in this die, there are besides the fixed axial cores for each cavity, twelve movable side cores, four being operated by blocks and angle pins at top and at bottom of the die and two at each side by similar blocks similarly operated. Except for flash removal and a little drilling, there is almost no machine work on these parts, yet the button shank makes a neat sliding fit in the body and slots cored in the mating parts register almost perfectly.

Another die with ten impressions, produces both halves of a cylinder housing, four circular spring cups, a tiny but complex U-shaped casting called an "inside spindle guide filler", an outside







Ten castings are made in this die. One group of four and one of two are duplicates. The remaining four are all different. The die block contains ten identical holes into which inserts are fitted for the various parts. At right is a gate of ten castings from the die. Cup-shaped parts are seats for torsion springs

cam, an outside spindle cam and another small casting. These parts involve only fixed cores projecting from cover or ejector dies or both and at right angles to die surfaces.

Because the knobs employed in the lock assembly are drawn from sheet stock and are hollow, those designed to receive a lock cylinder must be provided with a spool-like assembly called a cylinder housing which is cast in two halves. A pair of these castings is inserted before the shank stamping is closed in and the cap of the knob is applied. These halves are relatively simple die castings and are duplicates except that one has four tenons and the other four mortises into which the tenons of the mating half fit when the halves are assembled.

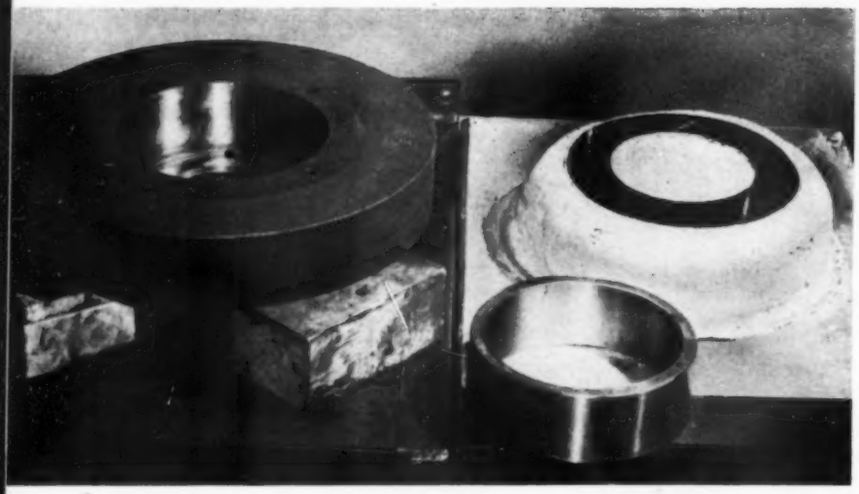
Several of the ten castings produced in the die have cam or other irregular surfaces that the die forms precisely and that would make the parts prohibitive in cost if they did not come from the die practically ready for use, save for trimming flash. One of the castings having a face cam includes at its center a cup that fits the head of a pin resembling a nail. This pin is inserted after casting and is fastened by a tool that strikes the edges of the cup and curls them inward over the head of the pin. Although such a pin could be cast in place, it would slow the casting rate unduly, hence application after casting is preferable.

All remaining castings for the final assembly are produced in an eight-cavity die. This die yields four serrated nuts used to fasten the lock body to the door and two each of the yoke-like castings. These parts, though simple to die-cast, would pose difficult problems and cost much more if they had to be made any other way. The nuts, after tapping, are assembled to stamped plates by a spinning operation and, when the lock is applied to the door, are screwed over the cast external threads on the tubular castings to fasten the assembly to the door.

Liquid Nitrogen

Interference fits of 0.017 in. are reduced to 0.012-in. clearance by cooling the bearing ring in liquid nitrogen in a simple container

BY R. E. BLUDEAU, Development Engineer
THE LINDE AIR PRODUCTS CO.



Swaging-machine bearing housing, left, with new bearing, center, and improvised liquid-nitrogen container, right, insulated with magnesia

Liquid nitrogen is poured from a special flask into the container until the bearing is completely submerged in the liquid

Long-handled tongs are used to remove the chilled bearing from the container. Severe burns will result if the metal touches bare flesh

REPLACING the large, hardened-steel bearing in a Torrington nozzle-swaging machine has been greatly simplified by using liquid nitrogen as a coolant to obtain a shrink fit. The bearing is approximately 13½ in. O.D., with a 1-in. wall thickness and is 5 in. long. It weighs about 40 lb.

Prior to the use of this technique, bearing replacements were major operations, requiring the services of from two to six men, the use of a 100-ton hydraulic press, and a supply of solid carbon dioxide sufficient to last overnight, because this length of time was required for thorough cooling of the bearing. The shrinkage obtained this way, however, was not sufficient to allow for a drop fit, and it was necessary to force the bearing into place with the hydraulic press, requiring 6 to 8 man-hours setup time to locate the massive swaging housing on the press table.

With the new process, the old bearing is flame-cut and removed, and the I.D. of the housing and the O.D. of the bearing carefully measured. In a specific case, the interference at room temperature was found to be 0.017 in. Shrinkage by liquid nitrogen at −320.4 F. will reduce the diameter by 0.029 in., thus giving a clearance of 0.012 in.

A simple liquid nitrogen container was made of light-gage sheet steel, formed in the shape of a ring to allow a clearance of several inches on each side of the bearing when it was located for chilling. The container was insulated with magnesia, such as is used for ordinary furnace insulation.

On the basis of 6 cu. ft. per lb. of metal it was estimated that 270 cu. ft. of nitrogen would be required, but it was necessary to obtain a 25-liter container (625 cu. ft.), as this was the smallest size available in the factory. A 15-liter container will be purchased for future use.

The entire job, consisting of cooling the

Simplifies Bearing Assembly

bearing to approximately the temperature of liquid nitrogen, aligning it with the housing, and dropping it into place, required about 10 min., and within a few minutes after the bearing was located, the housing was ready to be reassembled.

In addition to the obvious saving on time and labor, the use of liquid-nitrogen shrink fitting produces a tighter fit than can be obtained with other methods because of the greater initial interference. It is immeasurably better than press fitting because the pressing operation produces shear at the interface and actually decreases the coefficient of friction between the surfaces. No heavy machinery is required for assembly, and the only special equipment needed is a Purox container for the nitrogen. It is thus possible, in many cases, to complete the assembly at the site and eliminate transportation.

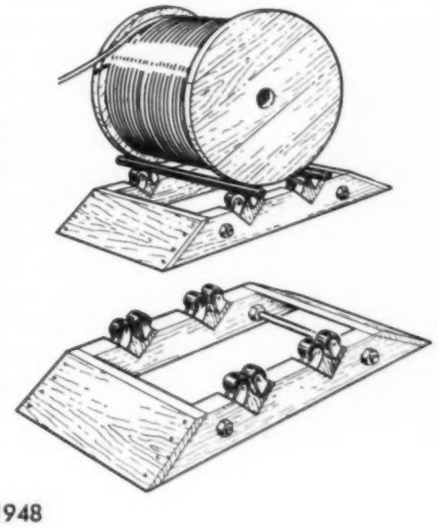
Chilled bearing drops into place without interference and expands to a tight fit almost instantly. Entire job takes only 10 min.

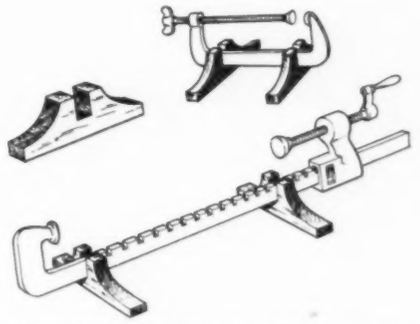
Short Cuts FOR THE SMALL SHOP

BY A. H. WAYCHOFF

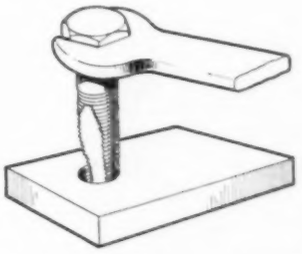
SMALL BUSHINGS of various sizes can be driven out of work without loss of time, if one has a "bushing punch" in his toolkit. To make the punch, take a piece of drill rod or round stock and turn step diameters, starting with say 3/16 in. diameter and advancing by 1/32nds. The steps need not be more than ¼ in. long. To drive out any bushing within the size range of the tool, merely insert the punch until a shoulder bears on the bushing.

CRADLES FOR REELS of wire rope will be found convenient in the maintenance department. These cradles consist of a hardwood frame, with a ramp to roll the reel up, and two casters set into the V's. Lay a piece of pipe on top of the casters, where they revolve freely on the casters as wire rope is pulled off the reel. Use of a cradle like this saves a lot of time and annoyance in getting wire rope off a reel in good condition.





WOODEN FEET will often increase the usefulness of C-clamps and cabinetmakers' clamps. If the feet are made with a wide base, as shown, they will be stable on the bench. Slots in the feet are a snug fit for clamps.



RUSTY THREADS can be cleaned out with a capscrew ground to a tapered flat on one side. Rust or grit in a hole ruins a tap in short order, but life of the capscrew doesn't matter by comparison.

PROBLEMS IN SHAVING FINE-PITCH GEARS

How shaving of fine-pitch spur and helical gears is done, some of the typical jobs and tooling considerations, are discussed by an acknowledged authority . . . Materials range from tool steel to nylon, jobs run the gamut of type and size

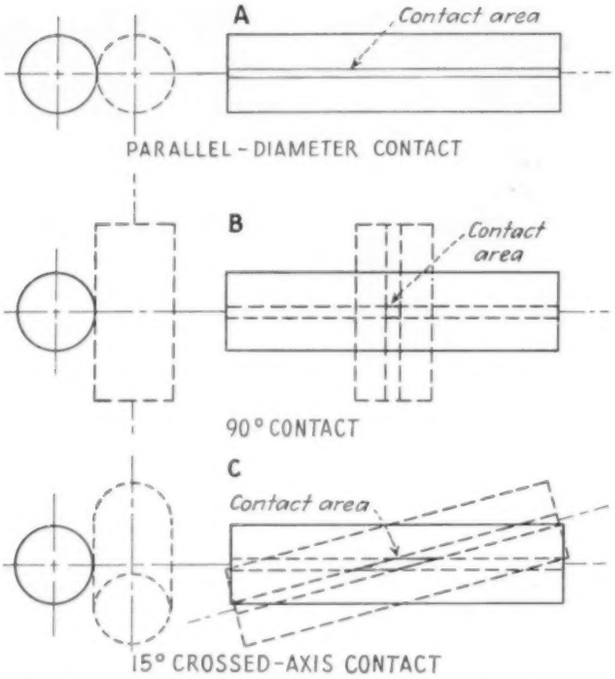


Fig. 1.. How the contact area between cylinders changes as the angle between their axes is varied

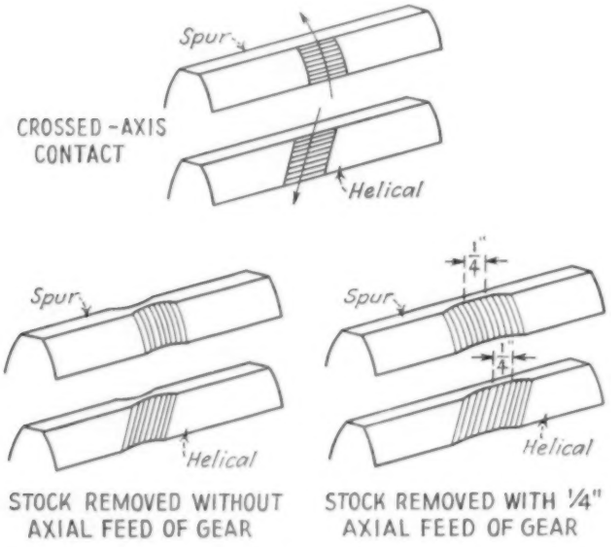


Fig. 2.. Lines and direction of contact on spur and helical teeth under crossed-axes cutting

BY LOUIS D. MARTIN
Gear Engineer, Camera Works, Eastman Kodak Company

GEOMETRIC aspects of the cross-axes shaving principle are well known. Here is a brief description:

To visualize the crossed-axes principle more clearly, consider two parallel cylinders having the same length and made of a plastic material. When brought together under pressure, their common contact surface is a rectangle having the length of the cylinders and a width varying with their diameter and contact pressure, Fig. 1A. If the axis of one of these cylinders is swung through an arc of 90° relative to the other, their common contact plane remains a parallelogram, but its area decreases steadily as the angle is increased, Fig. 1B. When the angle between the axes lies within the range of 10 to 30°, Fig. 1C, required cutting pressure is relatively small. The cutter and gear operation at crossed-axes, therefore, has greatly reduced tooth-surface contact.

As the work gear is moved away axially from the point of intersection of the two axes, backlash develops. Conversely, as the gear is returned toward the point of axial intersection (which is top dead-center of the imaginary cylinders), backlash disappears and the two members engage in tight mesh; the teeth of the cutter wedging between those of the work gear with each succeeding section, cutting deeper into the work-gear tooth until the point of axial intersection is reached and final sizing accomplished. The crossing of the axes compensates for the variation in sliding action from involute roll. As gear and cutter are brought together, cutting proceeds diagonally toward the pitch line and in a reverse direction as the teeth pass that point and begin to separate. This assures uniform cutting over the entire profile of the tooth.

The cutting action of the tool can be better visualized in Fig. 2. When the angle between the cutter and work gear axes is increased, the cutting action is also increased, but at the sacrifice of guiding action because of the reduced width of the contact

Based on a paper presented at the Semi-Annual Meeting, AGMA.

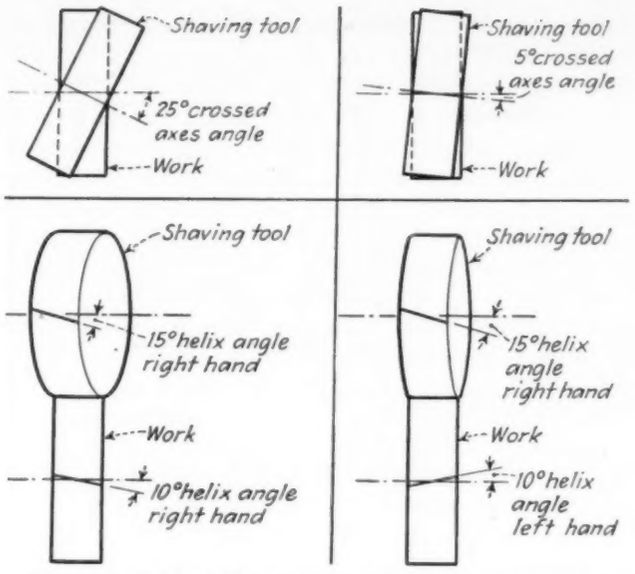


Fig. 3 . . Relationship between crossed-axes angle and the "hand" of the helix angle of tool and work

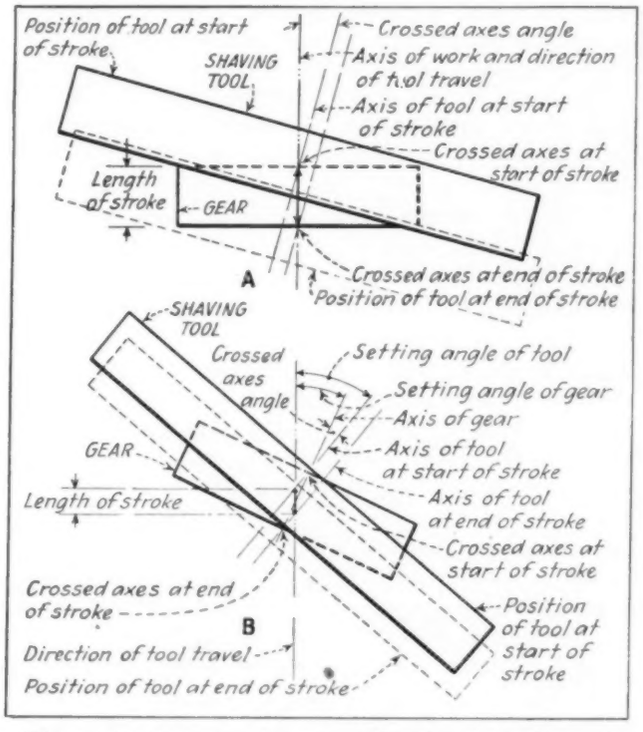

Position of tool at start of stroke
SHAVING TOOL
Crossed axes angle
Axis of work and direction of tool travel
Axis of tool at start of stroke
Crossed axes at start of stroke
Length of stroke
GEAR
A
Crossed axes at end of stroke
Position of tool at end of stroke
SHAVING TOOL
Crossed axes angle
Setting angle of tool
Setting angle of gear
Axis of gear
Axis of tool at start of stroke
GEAR
Length of stroke
Axis of tool at end of stroke
Crossed axes at start of stroke
Crossed axes at end of stroke
Position of tool at start of stroke
B
Direction of tool travel
Position of tool at end of stroke

Fig. 4 . . Tool traverse for conventional and for diagonal shaving

zone. Conversely, guiding action can be increased by reducing the angle between the axes; however, this reduces free-cutting action. In fine-pitch gears it is possible to employ much higher crossed-axes angles than in coarse-pitch gears, because of the increased contact which results from considerably more teeth per inch of diameter in engagement.

The shaving tool is made to have the same *normal diametral pitch* and *pressure angle* as the gear it shaves. Spur gears, for the purpose of this discussion, are considered as helical gears of zero helix angle. Given a tool of 15° right-hand helix angle, 20 normal DP., 20° normal pressure angle, it is possible to shave a spur gear at a crossed-axes angle of 15°. The same tool can likewise be employed to shave either right- or left-hand helical gears of the same *normal pitch* and *pressure angle*. When the hand of the tool and the hand of the work are the same, the machine setting is equal to the sum of their helix angles. When the helix angle of the tool and the work are of *opposite* hands, however, the crossed-axes angle is the difference between their helix angles, Fig. 3.

In conventional crossed-axes shaving, the tool must be reciprocated for a distance somewhat greater than the face width of the gear in order to carry the "crossed-axes point" (point of smallest center distance) across the entire face width; also the line of tool travel is parallel to the axis of the gear. In the *diagonal* or full-tooth shaving process the axis of the work is set at an angle relative to the tool traverse and the tool has to travel only a fraction of the distance to carry the "crossed-axes point" across the face of the gear.

In practice however, the tool is traversed a slightly great distance in order to relieve the pressure between the tool and the work and to remove the pressure line from the face of the gear teeth. This assists in increasing the skidding and cutting action of the tool, as well as increasing its life, because wear is more equally distributed across the face of the tool instead of being concentrated at one point as in conventional shaving. This method also has the additional advantage of permitting the shaving of shoulder gears or cutting into a recess.

Fig. 4 shows differences in amount and direction of tool travel and relative position of tool and work for conventional and diagonal shaving. In *conventional* crossed-axes shaving, a relatively small crossed-axes angle is generally employed, thus greatly reducing the effective skidding action and cutting ability of the tool. In *diagonal,* or full-tool shaving, the cutting action is materially improved because of the angular traversng of the work, and the resulting higher skidding action of the tool. This process is generally limited to face widths under 2 in. When the face width of the gear exceeds 2 in., conventional shaving is preferable.

During shaving, the tool drives the gear freely, as it rotates on its axis, without geared connection between them. The tool is advanced across the gear face, and at the end of each stroke, the center distance between cutter and work is reduced by a suitable amount depending upon the cutting conditions of the material, amount of stock to be removed and a number of other factors. For best results, the shaving tool should have a prime number of teeth, cr at least be prime to the number of teeth in the gear it shaves. This principle of gear refinement is based on the "hunting tooth effect" brought about by the continual orientation of the teeth in the cutter with those in the work.

The question is often asked, "How can a shaved gear have greater accuracy than the shaving tool?" It has been mentioned that the continual orientation of the teeth in the gear with those of the tool tends

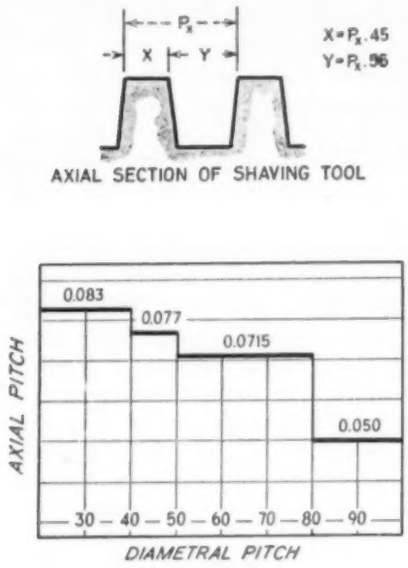


Fig. 5 ..Good shaving-tool proportions for various pitches

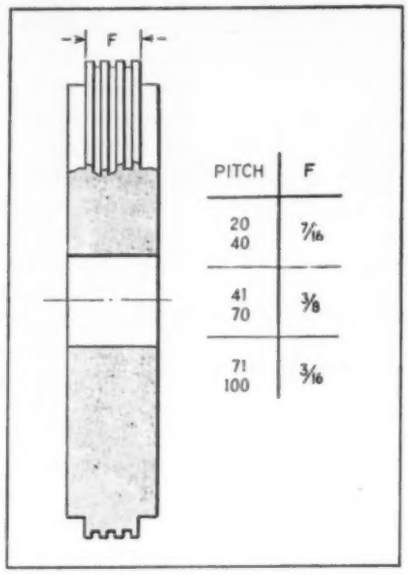


Fig. 6 ..Effective face width of cutters of different pitch

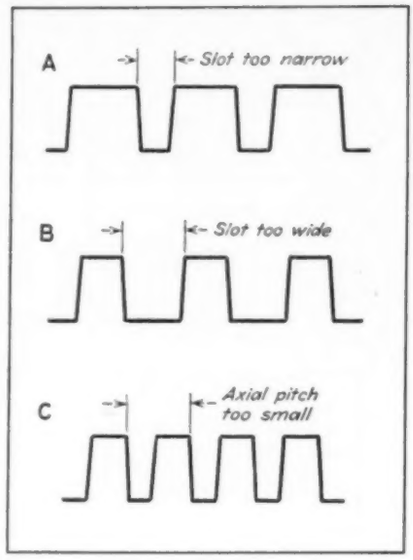


Fig. 7 ..Incorrect tooth proportions of shaving tools

to reduce errors. When the correct combinations of feeds and speeds are employed, the errors in the tool are integrated over a large number of teeth of the gear. If the shaving tool is larger than the gear it shaves, which is usually the case in the majority of fine-pitch gears, the eccentricity of the cutter is not directly transmitted to the work. Some of the other errors, such as profile and pitch error, are regenerative and do not completely disappear. When the work is *larger* than the cutter, however, some of the cutter eccentricity is transmitted to the gear, and high and low peaks related to the ratio of cutter and work will be found on the gear. An accurate shaving tool, properly mounted, will produce extremely accurate gears by this process.

Gears are shaved primarily to reduce the errors left by the cutting processes. Cutting alone does not, as a rule, yield the degree of accuracy obtainable by cutting followed by shaving. In the majority of cases the shaving operation can be justified by the savings made in cutting. The second and less-important reason for shaving gears is to improve the finish. This is *definitely* of secondary importance. High surface finish should be obtained by burnishing following shaving. A shaving tool that produces a high luster is not cutting freely and is not doing the work it should do, namely, increasing the accuracy of gear teeth. A free-cutting tool leaves a fine, satin-like finish. Burnished surface may be caused by one or a combination of the following:

1. A dull tool
2. Poor choice of crossed-axes angle
3. Wrong choice of method—whether conventional or diagonal
4. Wrong combination of feeds and speeds
5. Wrong cutting oil
6. Poorly designed tool with improper proportions between slot and land width

Fig. 5 and 6 show the best proportions of slot and land width for the majority of fine-pitch shaving tools. Cutters made with the slots too close together, Fig. 7A, will do more burnishing than cutting. A cutter with slots made too wide, Fig. 7B, will tend to dig and tear, especially on softer materials. Fig. 7C shows a condition in which the axial pitch is too small. The first fine-pitch shaving tools had a

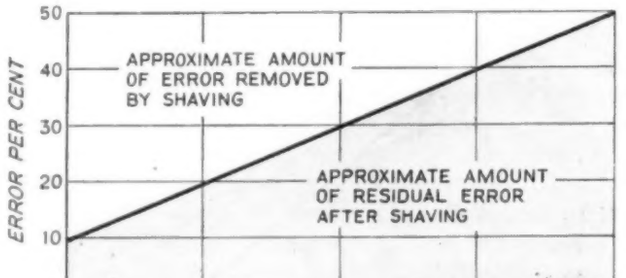


Fig. 8 ..Approximate relationship between material hardness and the effectiveness of shaving

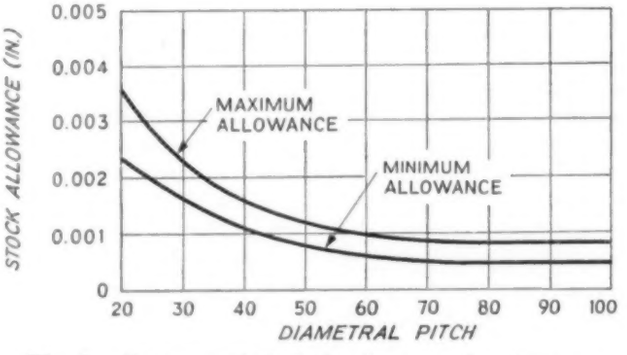


Fig. 9 ..Recommended stock allowance for shaving gears of various pitches, in terms of tooth thickness

helix angle of 10°, the same as had been developed for the automotive plants, among the first to adopt shaving. Practically all of the shaving experience had been obtained from this source, which had largely one set of conditions to satisfy. Materials, pitches, and helix angles were fairly similar. When we tried to apply this "know how" to fine-pitch gearing with vastly different conditions of deflection, materials, pitches, and tool construction, we found the results very disappointing.

In the early days we considered ourselves lucky if we could consistently reduce the cutting error by half, by means of a shaving operation. Today, it is possible to reduce the *cutting* error, under proper conditions, to *10%*, by shaving. In other words, given a gear having a total composite error of 0.001 in., it is possible to reduce this error to 0.0001 in. It should be emphasized that this amount of correction is obtainable when conditions are ideal in every way, including comparable *blank* accuracy.

The amount of correction that can be obtained depends on many factors chief of which are the *cutting ability* of the tool and the machinability of the material. As machinability of the material (as it affects shaving), is approximately relative to Brinell hardness, the chart in Fig. 8 will serve as a guide for the amount of correction that can be expected for various materials under good conditions.

One might suppose that by repeatedly shaving the same gear a number of times, exactness of size and the elimination of all composite error would result. This is not quite true, especially in the softer metals. Actually, the shaving operation cold-works the surface, and when a certain point is reached, no repeated shaving seems to improve the gear.

A number of aluminum-alloy gears were reshaved 30 consecutive times in a test made to determine the correction obtainable. Infeed was not changed after the first shaving cycle. After the 30th shaving, the accuracy had not improved any measurable amount. This is undoubtedly the reason why burnished gears are hard to shave. On the other hand, a certain amount of roughness in a preshaved gear is desirable, because it tends to make the cutter bite into the surface. It is common knowledge that hobbed gears shave easier than shaped gears. This is undoubtedly because the characteristic surface pattern of hobbed gears favors shaving.

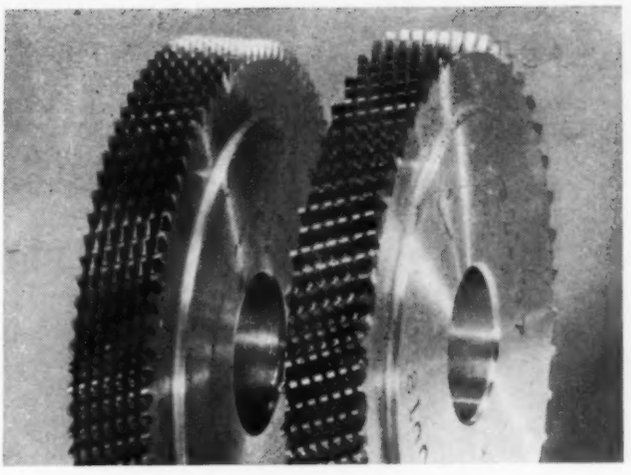


Fig. 10 . . A conventional grooved shaving tool (left) compared with a tool grooved normal to the helix angle (right)

Best results are obtained in shaving gears when a slight undercut is produced in the teeth below the last point of contact. This undercut, Fig. 11A, relieves stress concentrations at the point of the shaving tool and provides against the possibility of a high fillet. This is especially desirable in fine-pitch gears because of the relative weakness of the teeth of *fine-pitch tools.*

Undercut is sometimes produced in pre-shaved gears by cutting the teeth deeper than standard. While this convention *does* provide the necessary clearance for the shaving tool, it also weakens the tooth. A better way of producing the shaving-tool clearance is by means of so-called *protuberance* hobs or cutters; Fig. 11B shows such a hob. These hobs are currently available as fine as 72 DP.

As materials for fine-pitch gears run the gamut from tool steels to nylon and similar plastics, a great variety of cutting conditions exists. Shaving is affected by many factors, among them machinability and the cutting ability of the tool. (Cutting ability is of great importance when shaving soft nonmetallic materials like phenolic plate and nylon).

Two tools, one grooved in the regular manner with grooves normal to the axis, and the other with grooves normal to the helix *angle* are shown in Fig. 10. Cutting properties of this latter tool are increased considerably, but it is expensive to produce.

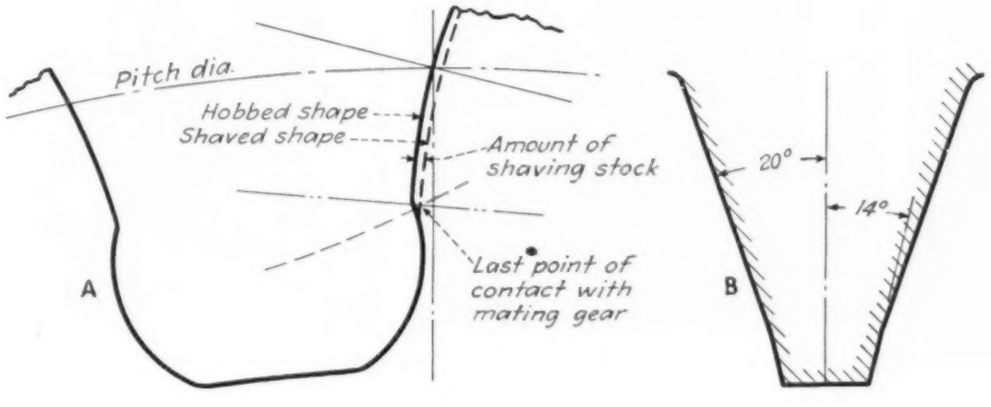


Fig. 11 . . Profile of a gear tooth protuberance-hobbed with undercut in preparation for shaving (left), and a section of the tooth of a protuberance hob (right)

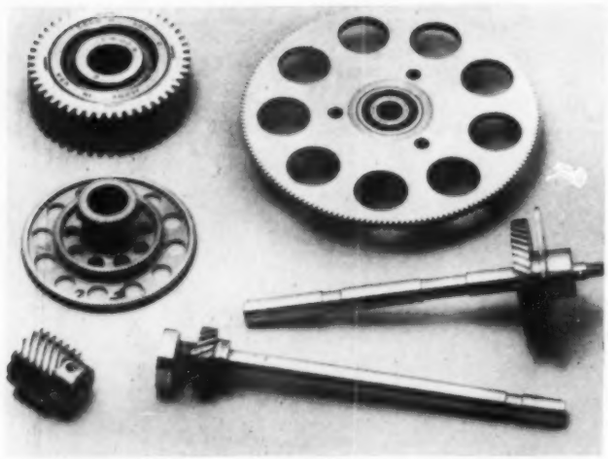


Fig. 12 and 13 . . Typical current fine-pitch shaved gears, ranging from the nylon helical pinion and miniature steel gears at left to a magnesium cluster gear, a high-helix pinion with hub, and gears shaved on journals and shafts like those above

It has been used experimentally for shaving phenolic and nylon gears by the diagonal method, with remarkable success.

The first machine (January, 1942) *especially designed* for shaving fine-pitch gears is shown in Fig. 14. Shortly after came the machine in Fig. 15. These two, and others which followed, were of immense help in satisfying the demand for precision-shaved gears brought about by the late war. Fig. 16 shows the latest of the series. None fully satisfy the needs of the shaving requirements of fine-pitch gears.

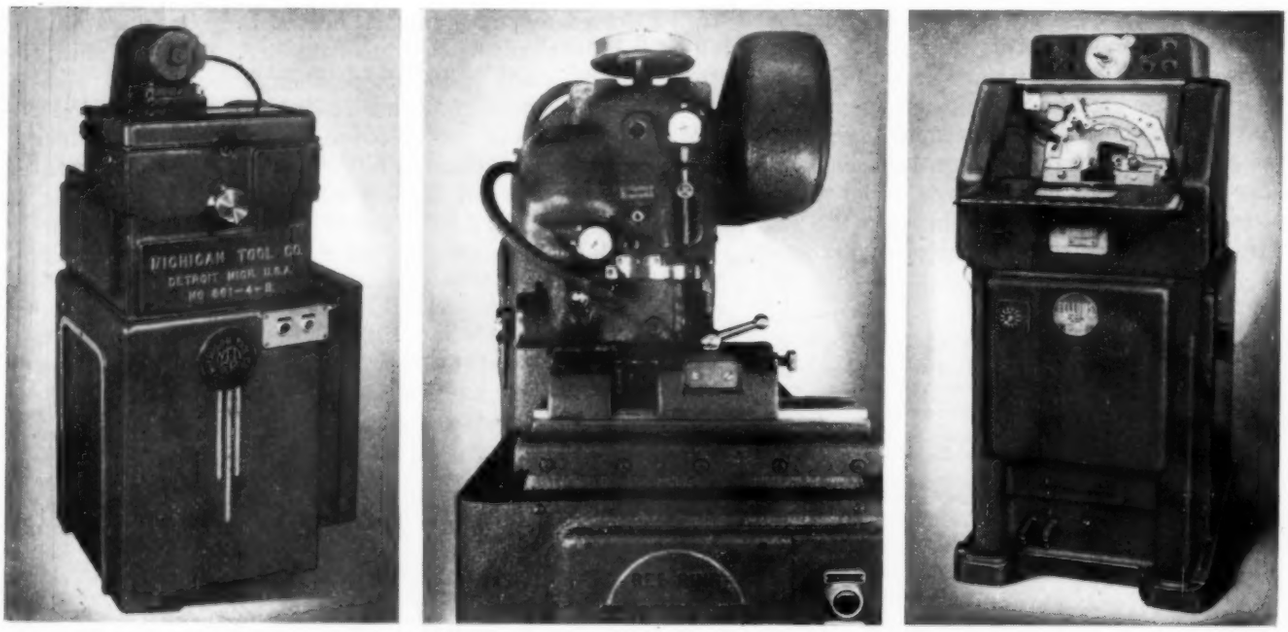
Typical fine-pitch gears to be shaved are shown in Figs. 12 and 13. The small pinion in Fig. 13 is 100 DP and has 11 teeth, and operating diameter of 0.120 in., and is stainless steel. The flat gear mates with the pinion and has 30 teeth. The pinion with a hub is 80 pitch and has 12 teeth.

At left in Fig. 12 is a 100-DP. cluster gear made of a magnesium alloy. Accuracy required is 0.0002 in. *total composite error;* five times more accurate than the best circular master gear commercially procurable in this pitch. At right in Fig. 13 is a nylon helical pinion, 30° helix angle, 72 normal pitch. This part shaves easily with a normal gashed shaving tool at a crossed-axes of 30°. Water-soluble oil prevents heat from being generated.

Gears which are mounted on anti-friction bearings, are sometimes cut and shaved on their bearings. In many cases the accuracy of the gears exceeds considerably the accuracy generally obtainable in bearings. Examples are shown in Fig. 12.

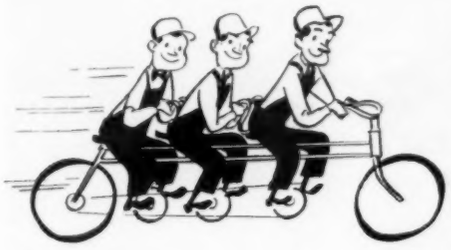
Gears of very high helix angles like that at lower left, Fig. 12, respond best to diagonal shaving with a relatively low crossed-axes. The gears shown have a 60° helix angle, are 24 transverse pitch, and are made of SAE 1020 steel.

A pair of helical spur gears shaved on their journals, are at top, Fig. 12. This procedure permits a high degree of accuracy. A shaving machine having great flexibility is required for the range of pitches and diversification of materials found in gears of this kind. The machine *best suited* for the fine-pitch gearing field should have provisions for quickly varying the number of passes and depth of cut per pass, without having to change depth-feed cams and table-traverse gearing. It should also have a wider range of cutter speeds than is obtainable in current machines—a problem for machine makers to ponder.



Figs. 14-16 . . Three shaving machines for fine-pitch gears, the Michigan, Red Wing, and Fellows No. 4

TALKING SHOP



Co-op Unions

ONE LARGE METALWORKING PLANT has half a dozen unions—C.I.O., A.F.L. and independent—and has been experiencing some strange things lately. The many are easier to get along with than one would be, because local heads are co-operative and most of the workers (75%) are local property owners rather than drifters. Union presidents hold weekly conferences and have been settling so many of the problems that a recent meeting of the largest union had to be cancelled for lack of a quorum.

The large C.I.O. union started a newspaper a while ago. It was the usual labor mouth organ—and lasted only a few months. Then *all* the unions petitioned the plant management to support a combined plant paper. The management refused—pointed out potential drastic action by the internationals for "infiltration." But the weekly paper was started, with a single paid editor and one associate editor for each co-operating union. The unions bear all editorial costs, the company all mechanical—and the paper has been running well for over a year.

Recently, the unions suggested a combined picnic. The management again protested, because of the internationals. But the picnic was a huge success—sponsored by the plant newspaper! Now plans are underway for a combined Christmas party under the same sponsorship.

The major reason behind this latest plan is the children, who can't understand — or believe in — more than one Santa Claus. Last year, children of C.I.O. union members were issued cards to be redeemed at a local store by Santa Claus in return for presents. A.F.L. members' children, their playmates, went along and demanded presents too—card or no card—because their dads worked for the same company. Said the C.I.O. local president resignedly: "We've had to give presents to A.F.L. kids too—how can any grown-up explain to a child why the kid next door can't share Santa—or the difference between C.I.O. and A.F.L.?"

The large C.I.O. union went to food distributors with a plan for co-operative buying to beat rising food prices. Union members clerked voluntarily on Friday evening and all day Saturday, so canned goods could be resold at union cost, by the case only. Within a month, they invited members of the other unions to buy there too, on the same terms. At last report, they're selling over 200 cases of canned goods a week, are now intending to sell "broken" cases of mixed can goods and 3-can lots at 5% brokerage fee, because so many members can't afford case purchases. . . . Again the company disagrees, particularly because of the usurpation of the local storekeepers' function, but what can the company do?

And why should it worry about aspirin for the internationals' potential headache?

Mass Precision

AT W. H. NICHOLS CO., Waltham, Mass., tolerances on gear pumps for nylon, rayon, and fuel service are a quarter of a tenth (0.000025 in.) on critical parts, clearances a tenth (0.0001 in.) on a side. Yet production methods have been developed so as many as 40,000 pairs of gears can be processed each month, plus parts for 40,000 housings. Under such conditions, jig grinding and lapping are done on a production basis. . . . Basic reason is that units must not vary over 1% in delivery under pressures ranging from 0 to 100 psi.—and at speeds as low as 70 rpm.

Daffynitions

POLITICAL SPEECH: campaign boreatory. . . . JACK: something needed to lift a car—and to keep it running. . . . LAME DUCK: a gone goose. . . . CHEWING GUM: impediment in teen-age speech. . . . SMALL LOAN: going into the hole to get out of a rut. . . . LAWYER: he helps you get what's coming to him. . . . CAMPAIGN SPEECH: a patter of little feats. . . . UMPIRE'S VOICE: a base bawl. . . . SILENCE: the only thing that can't be misquoted.

Resistance

RESISTANCE WELDING claims to offer 30% more strength as an alternative to current bolting and riveting of aircraft. The resistance in this case is encountered before welding begins.

Bent Light

PROPERLY GRADUATED lines in clear glass look black, without filling, because of this optical fact: Light rays entering the glass strike the 45° walls of the V groove, are turned at 90° into the glass, never emerge. Thus the line looks black to the eye. . . . But, if the base of the V is imperfect, light rays are deflected at the sides and transmitted through the bottom, giving a confusing image. In top-accuracy instruments, glass verniers appear preferable, because they can be superimposed over the base scale. This permits exact reading of coincidence, without the distraction of the normal clearance between scales.

No Contract

JIM MCCARTHY, old-time New England machine-tool salesman, recalls the time he offered to sell two slightly used gear cutters to Manning, Maxwell & Moore. The deal ended as a swap for six 14-in. Putnam lathes, the only paper that passed being the check for the difference. At that time, a Brown & Sharpe No. 3 sold for $340, a Putnam lathe for a bit under $400, and Jim was still under 20. . . . Jack Ladden, general manager of O. S. Walker, then recalled a similar situation in which he purchased a V&O press for Crompton & Knowles—and forgot about it. In due course, the press was at the door—and Jack had to make out the regular purchase order and get it authorized while the truck waited. Here again was a word-of-mouth order, the only paper passing being the check.

Heavy-duty 48-in.-dia. shaving machine can handle 96-in. shaft length. Dual work spindles permit accommodation of small pinions down to 4-in. dia. Cutter head handles either conventional or underpass shaving and has an attachment for shaving internal gears

HOW LARGE GEARS ARE SHAVED

Diameters and shaft lengths to 96 in. can be handled on newer machines.

Procedure is explained and some problems indicated

BY GEORGE P. MAURER
Supervisor, Gear Precision
THE FALK CORPORATION

GEAR SHAVING, using rotary machines, was introduced 13 or 14 years ago. At that time machines for shaving gears up to approximately 12 in. dia. were available. Shortly after, a machine for shaving gears up to 24 in. was introduced, and since that time has been in constant use at Falk for shaving speed-reducer and general-purpose gearing.

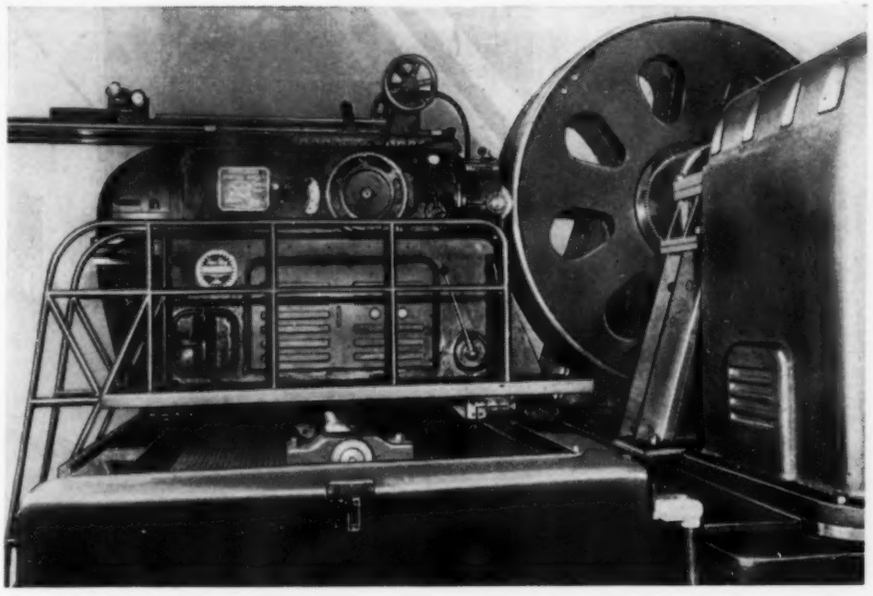
While these machines were developed primarily for automotive and other lightweight gearing, their application to the large variety and types of industrial gears has been highly successful. However, certain limitations became apparent as the work approached the capacity of the machine in both blank diameter and shaft length. With the cutter axis above the work in a vertical plane with the work axis, some difficulty was experienced in loading large gears integral with their shafts. As the cutter drives the work on this type of machine, large gears (with their heavy mass and moment of inertia) also presented a driving problem. Sometimes the cutter gouged the work during acceleration after reversal of rotation. Another limitation was the shaft length between centers. High-ratio speed-reducer gearing results in pinions having diameters well within the capacity of a 24-in. machine, but the shaft length may be 48 in. and longer, so special "goose neck" centers on the machine will not accommodate the work.

Large Machine Development

These limitations were brought to the attention of the machine builders. In collaboration with the gear manufacturers, they developed machines for capacities over 24 in. dia. and providing the necessary features to accommodate heavy-duty gearing. The cutter spindle was mounted so its axis and

Abstracted from the Symposium on Gear Finishing at the Semi-annual Meeting, AGMA, in Chicago.

the work axis were in a horizontal plane, the drive for rotation of the work was incorporated in the work spindle and the main base was enlarged to accommodate long shafts. Heavy-duty construction was used throughout to assure the required rigidity for shaving marine gearing as well as large-size industrial gearing to precision limits.



This 96-in. dia. heavy-duty machine was developed to shave the bull gear of turbine-driven marine-propulsion units for the U.S. Navy. Features include provision for supporting the shaft and gear assembly on its journals and a fixture for checking the setup and alignment of the gear with the cutter

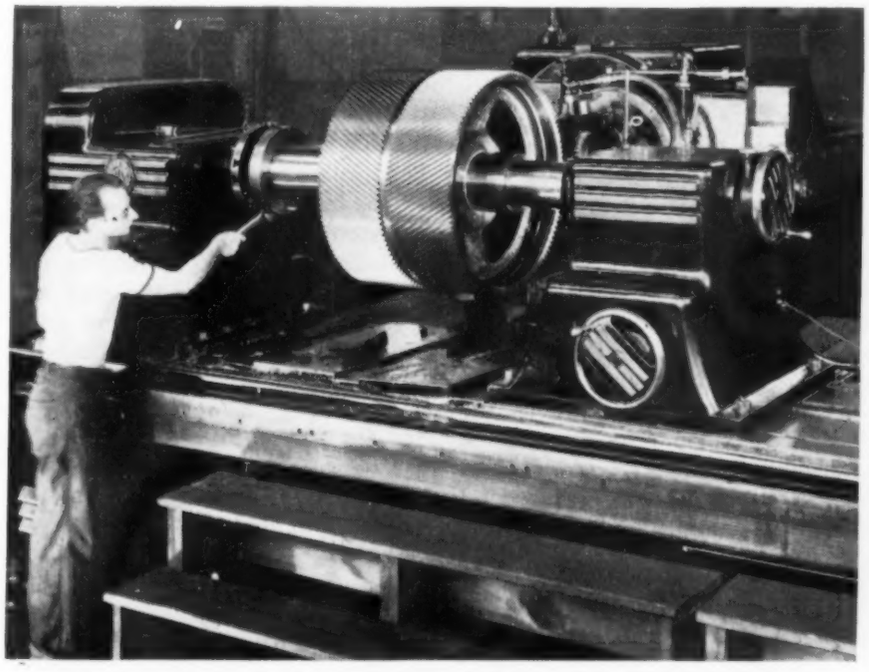
Corrective Effects of Shaving

The tooth-finish refinement and corrective effects produced by the shaving process on large gears are, in general, the same as those produced on smaller gears. However, the same degree of refinement may sometimes be more difficult to achieve. For this reason, closer control must be exercised over the operation itself as well as the various factors which influence the results.

Primarily, the shaving process exerts its greatest influence on profile correction and surface finish, regardless of the size and pitch of gear shaved. This characteristic, therefore, provides the desired refinement on large-size gears of coarse and medium pitch where the surface finish and tooth profile are more difficult to hold within prescribed limits.

Correction of helical lead and tooth spacing by shaving is influenced by a variety of factors and the degree of refinement obtainable is considerably less than that obtained on profile and surface finish. It is obvious that correction of tooth spacing and helical lead can be obtained more readily on small and medium-size gears of relatively narrow face. The corrective influence of the shaving contact zone decreases as the size of the work increases in diameter and face width so shaving is less effective in correcting tooth spacing errors in large-diameter gearing.

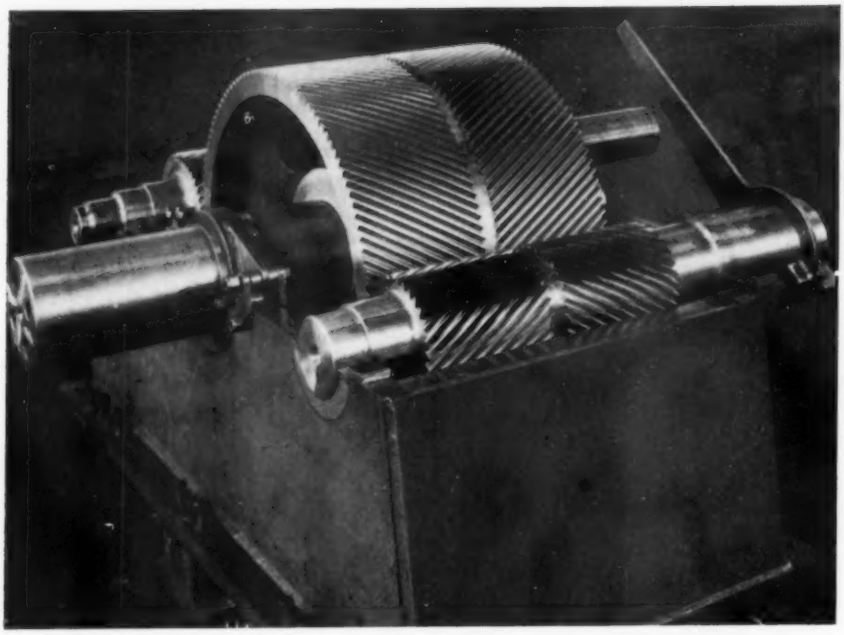
Errors or variations in helical lead cannot be satisfactorily corrected on wide-face gearing in shaving. It is, therefore, of prime importance to maintain rigid control over the gear-cutting operation to assure correct helical lead and tooth spacing. This makes it possible to attain the inherent advantages and improvements of the shaving process on large-size gearing.



Shaving a 30-in.-dia., 4-D.P., double-helical gear for a diesel-driven reversing marine propulsion unit on a 48-in. machine. For a Navy LST, the gear has 119 teeth and 10-in. face per helix. Average stock allowance for shaving was 0.0025 in. per side. Excellent tooth finish and helical lead were established

Range Cutters

It is obvious that designing a shaving cutter to suit a particular pinion or gear—the procedure for most quantity-production items—can not be applied to the wide variety of large-size gears encountered in the general-purpose and speed-reducer field. Cutters designed to shave pinions and gears with an appreciable range in numbers of teeth have been very successful in shaving large gearing of medium and coarse pitches. Cutters of this type are usually referred to as "range cutters." Their advantages in tool-cost reduction and



Shaved pinions and gears for reversing marine propulsion units are checked in this contact testing fixture. It shows excellent tooth contact after shaving. Similar results have been obtained on all types, including high-speed gearing and turbine-driven marine gearing

convenience are at once apparent.

However, one important factor must be taken into consideration. A given cutter will, as a rule, produce a slightly high involute on small numbers of teeth and a low involute on high numbers of teeth. When a pinion and gear are mated, these errors are cumulative, so their magnitude must be held to a minimum. A survey of what numbers of teeth in pinion and gear are to be shaved with a given cutter usually permits a satisfactory design for the cutter to be established.

Cutter Proportions

Shaving-cutter proportions for tooth thickness and addendum are mathematically determined from the specifications of a mating set of gears based on actual backlash and last point of contact. From experience with range cutters, it has been found that the mathematically determined dimensions for cutter-tooth thickness and addendum should always be augmented by experimentally shaving pinions and gears and checking the results on depth of cut against actual requirements. Specifications and tolerances for cutter dimensions can then be established for a given cutter.

In some cases, range cutters may not produce optimum results when approaching the generally accepted high and low limits for cross-axis angle, but other factors (such as numbers of teeth, hardness and pitch) affect this condition so that no definite rule or criterion can be established.

Cutter-Work Mesh Pressures

While mesh pressures are usually of no concern in applying the shaving process, there are a few exceptions in the speed-reducer and general-purpose field. Small-diameter pinions of the solid-on-shaft type, as used in standardized speed reducers, have long shafts with respect to their diameter. In these cases, the separating force at the mesh often causes shaft deflection. On large, wide-face gears, the weight plus the separating force sometimes causes overload on head- and tail-stock spindles of vertical machines.

Difficult Problem

At the present time, there appears to be little or no information on the magnitude of these forces. Because they vary with pitch, work and cutter diameter, pressure angle, cross-axis angle, cutter serrations, feed, hardness of material, etc., it becomes a difficult problem to solve satisfactorily.

Separating pressures can be minimized by increasing the cross-axis angle but on small-diameter pinions this usually results in considerable loss of helical lead control. A reduction in the feed per pass seldom reduces such pressures to a satisfactory limit.

Speeds and Feeds

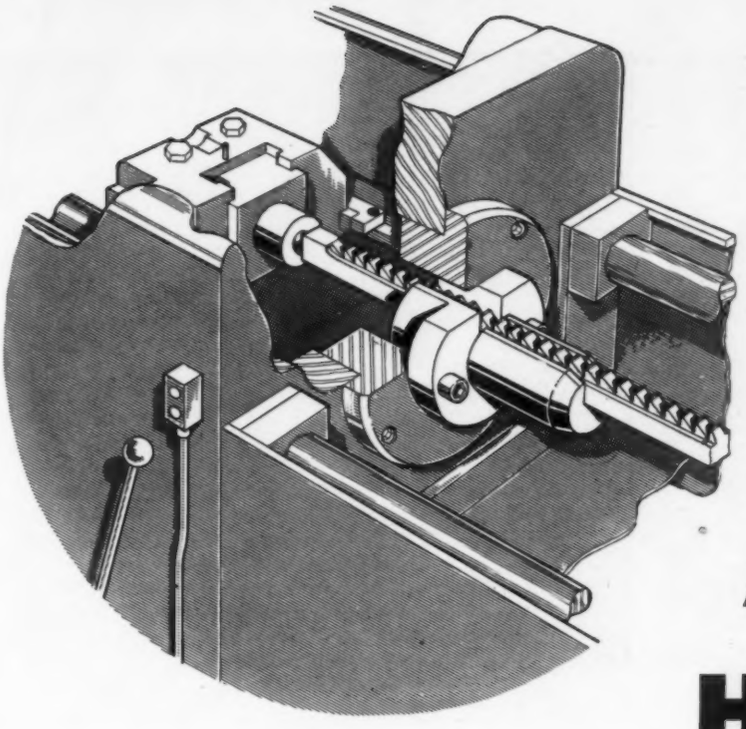
A rotative speed of approximately 300 fpm. represents an average value used successfully on many gears, but speeds as high as 450 fpm. have been used in accordance with machine manufacturer's recommendations. Mean values for table feeds vary from 0.5 ipm. for a 48-in.-dia. gear to about 4 ipm. for pinions 4 in. in diameter and smaller.

Experience in shaving a wide range of speed-reducer and industrial gearing indicates that speeds and feeds can be varied appreciably without seriously affecting tooth finish and profile. However, a given size and type of gear may require special attention to establish the correct speed and feed to obtain optimum refinement of tooth finish and profile.

An Example

As an example of the effect of feed and speed on the work, difficulty was experienced with vibration and poor tooth finish on a double helical pinion with a long shaft. This pinion had 48 teeth, 4 DP. and 10-in. face per helix. Changes in speed did not result in any improvement, but by increasing the speed and decreasing the feed, vibration was eliminated and good finish and profile were obtained. On a recent test on pinions of 8 DP. and 3½-in. dia., speeds from 260 to 390 fpm. were used with a table feed of 2.4 ipm. No change in tooth form, surface finish or helical lead was found in this range of rotative speeds.

Within the range of hardness on material which permits shaving with economical cutter life, there usually is no need for variations in speeds and feeds. However, on extremely hard materials, it has been found advantageous to decrease standard values.



A HANDBOOK OF . . .

Horizontal Broaching Fixtures

BY BEN C. BROSHEER, ASSOCIATE EDITOR, AMERICAN MACHINIST

Broaching with power-operated machines is a relatively new process. Yet, in recent years it has established spectacular records for precision and high production rates. It is economical because single cuts can be made quickly, finishing operations usually can be eliminated, and in many cases a number of cuts can be made simultaneously. Broaching today is being used for finishing surfaces of nearly any shape, both internal and external, where the surface is parallel with the axis of the broach, there are no obstructions in the plane of the surface being machined, and the part has the strength required to withstand adequate supporting pressure and broaching thrust.

Modern broaching equipment has been called one of today's best production investments. And a good case can be made for it when the machine is tooled with properly designed broaches and workholding fixtures. Often, the selection of the broaches and fixtures is of greater importance than the selection of the machine itself. Many broaching operations can be performed on any one of a number of different types and sizes of broaching machines, provided it has the capacity and stroke required. But the design of tools and fixtures requires considerable experience if full advantage is to be taken of the broaching process. The various factors involved must be carefully balanced to insure high production rates at low unit cost.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

Copyright 1948, by McGraw-Hill Publishing Co., 330 W. 42nd St., New York 18, N. Y.

Accurate alignment of puller, broach and fixture is essential. When a follow-rest is employed, it too must be maintained in correct alignment with the center of the ram throughout the stroke. In this setup made by Continental Tool Works, involute splines are being broached in a heavy steel tractor part. Weight of large broach makes a follow-rest necessary for maintenance of accuracy

Horizontal broaching machines of conventional design are especially suited for internal broaching. Properly tooled, they are also very efficient for many surface broaching jobs, as indicated by the above setup on an Oilgear machine. Both present and future requirements should be considered when selecting a broaching machine. Adequate capacity and a sufficient length of stroke are essential

HORIZONTAL PULL-TYPE broaching machines are used throughout the American metalworking industry for both internal and surface broaching. Their principal application is in finishing round, square, hexagonal, and splined or serrated holes, and in cutting keyways in the bores of gears, pulleys, cams, and similar parts. It was for such operations that they were originally developed. But in recent years, ingenious tool engineers have developed fixtures and broach-guiding devices which make possible the economic application of the conventional horizontal broaching machine to many surface finishing operations. A number of such setups are shown.

Conventional horizontal broaching machines pull the broach through or across the workpieces. Earlier screw-type horizontal machines have been almost entirely superseded by hydraulic models because of higher cutting and return speeds, cushioned pulling action, protection against overload, direct gage reading of pull exerted, and ease of operation. Hydraulic horizontal broaching machines of conventional design are made in single and twin-ram models. The twin-ram units, made only in small sizes, make possible higher production rates, because the two rams work alternately. One ram makes a cutting stroke while the second returns. Twin-ram machines can be operated easily by one man.

There are a number of variations in the design of conventional horizontal hydraulic broaching machines, but basically each consists of a horizontal ram, a broach, and a work-locating device. Each has a vertical faceplate on which the fixture is mounted. For internal broaching, this fixture is usually only a simple faceplate or bushing which holds the workpiece against movement as the broach cuts. More complicated fixtures, some of which both guide the broach bar and hold the workpiece, are employed when the cut taken by a hole broach is not evenly distributed around the periphery of the hole, and for surface broaching.

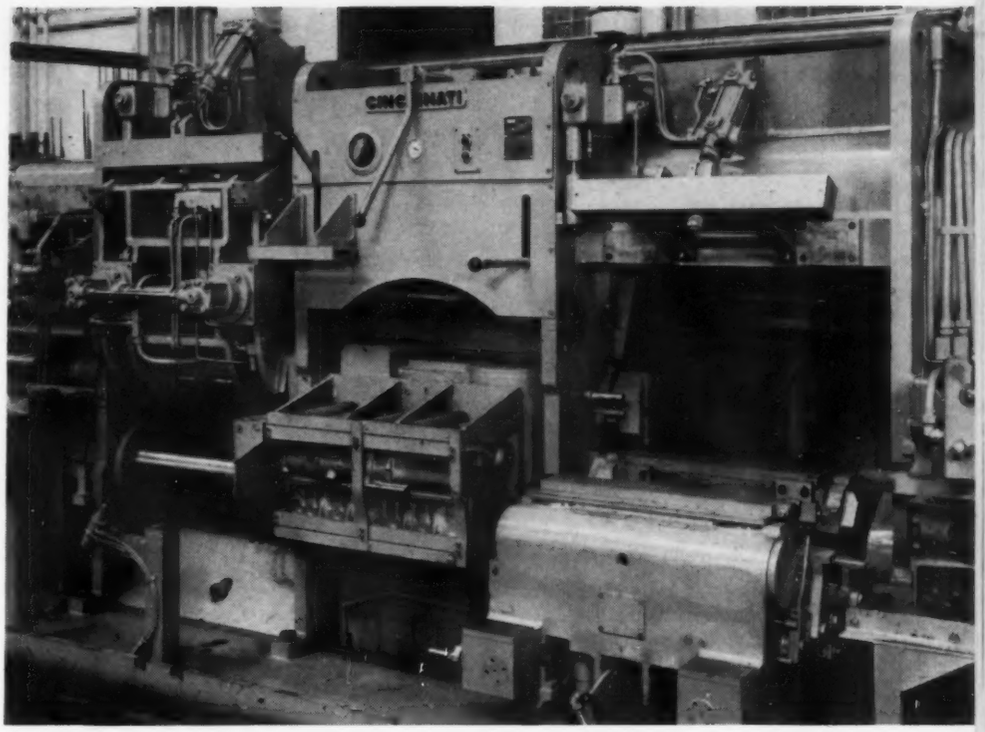
An important accessory for high-production internal broaching, particularly when heavy broaches are used, is the sliding broach support or follow-rest. These units are made in hand- and power-operated types. The power-operated follow-rest withdraws the broach from the puller and fixture when the ram has returned to the starting position. In most cases, the follow-rest continues to support the broach during the cut so the weight of the broach will not cause it to drift out of position.

No discussion of horizontal surface broaching can be complete without consideration of the very large machines for engine cylinder blocks and other automotive parts, first made during the early 1930's; the high-production, heavy-duty machines with trunnion fixtures developed in recent years to permit longer ram strokes and higher capacities than would be possible with vertical machines of convenient height and allowable unit floor loading; and the horizontal continuous machines used for rapid surface broaching of large quantities of small parts. But fixtures on

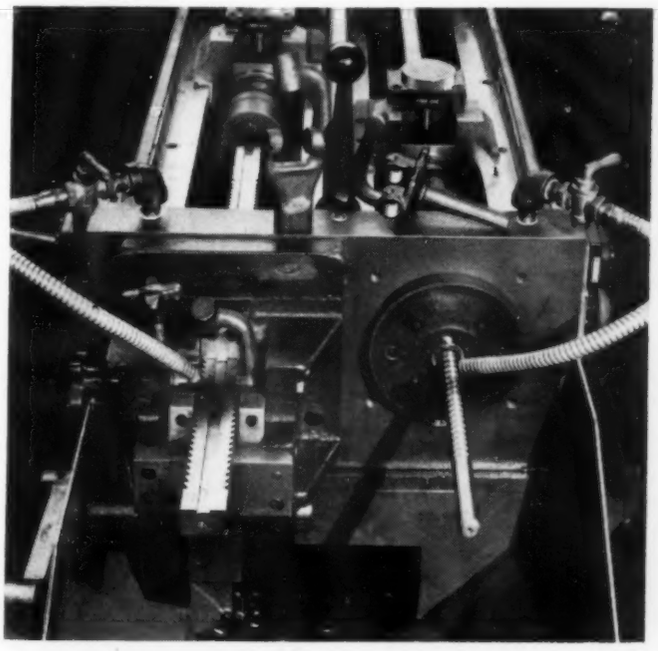
these machines are entirely different in design and construction from those employed on conventional horizontal broaching machines. In many cases they are very similar to fixtures used on vertical surface broaching machines, described in "A Handbook of Vertical Surface-Broaching Fixtures," (*A.M.*—Vol. 92, Jan. 1 and 15, 1948). Only fixtures for the more common horizontal broaching machines of conventional design are considered in this discussion.

A number of factors must be considered when tooling up for horizontal broaching. Type and condition of the material to be cut, diameter and length of hole or width and length of surface to be broached, cutting and return speed of the machine, cutting fluid, design of fixture, and type and capacity of the machine, all have a controlling effect upon the efficiency of the operation.

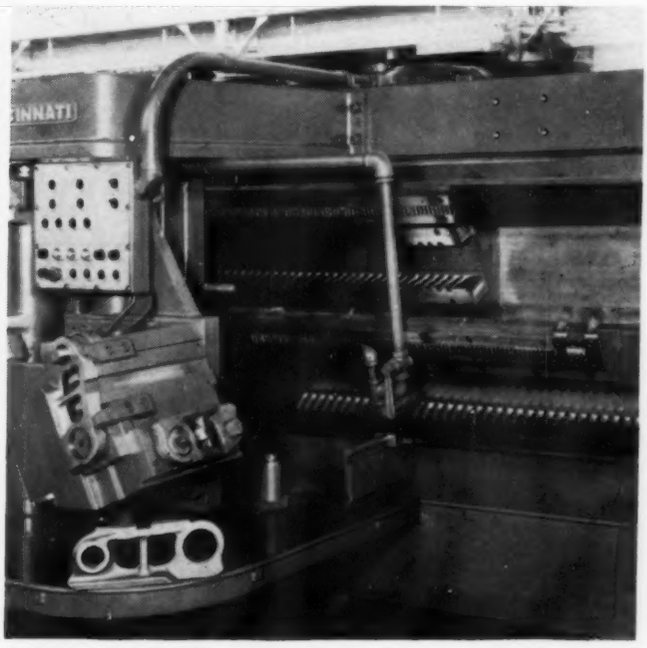
Hydraulic power used on all modern broaching machines gives smoother action and better control of cutting speed so maximum tool life, better finishes and closer ac-



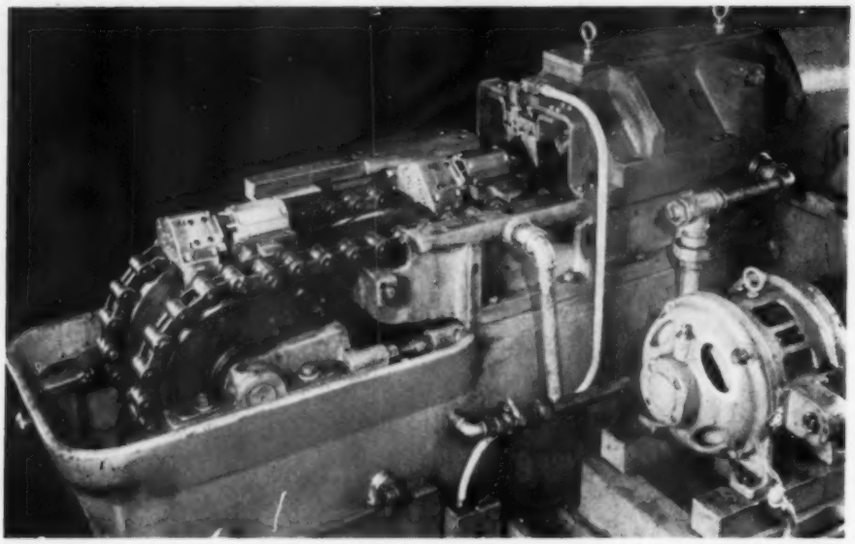
Hydraulically clamped trunnion fixtures on this Cincinnati horizontal Hydro-Broach, with turnover device between, finish five surfaces on 60 cylinder blocks per hr. Since their introduction in 1933, such special-purpose machines have become popular in the automotive industry for broaching exterior surfaces on cylinder blocks, heads and similar parts. Capacity ranges up to 100 tons. Fixtures and conveyors are usually integrated with machines. In unit shown, broach slide carries two sets of inserts. Top set cuts on right-to-left strokes and bottom set on left-to-right strokes of ram



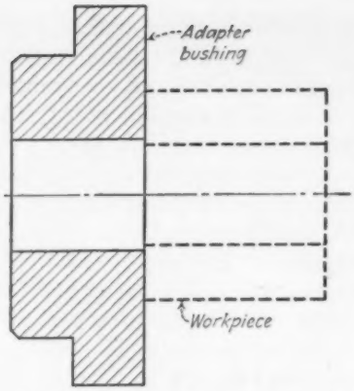
Both heads of twin-ram machine can be tooled for the same job, or for entirely different operations, as shown. Here, the right-hand broach in an Oilgear 6-ton, 36-in.-stroke twin unit cuts two 0.828-in.-dia. king-pin holes in a steering gear knuckle. Faceplate fixture at this position has an equalizing hemispherical bushing so hole in part automatically aligns with axis of broach. Setup at left broaches inside surfaces of bosses on front axle fork. In each case parts are shown just above their fixtures. Fixtures were developed by Detroit Broach Co.



Horizontal hydraulic Hydro-Broaches introduced by Cincinnati Milling Machine Co. for heavy-duty surface broaching operations requiring greater broaching capacities and longer strokes than are reasonable for vertical machines are made in two types with vertically hinged trunnion fixtures, and with horizontally hinged tilting fixtures. Broach holders and fixtures can be exchanged with others when the machine is to be set up for different parts. Requirements for correct fixture design are same as for fixtures used on vertical units



Continuous chain-type broaching machines developed by The Foote-Burt Co. are fundamentally different from other machines, since broaches are stationary and parts move past them. Machine consists of base and driving unit with several work-holding fixtures, mounted on an endless chain, that carry work through tunnel where it is passed under broach. Workpieces are automatically clamped, machined and unloaded. Setup shown was tooled by Detroit Broach Co. for cutting rack teeth in adjustable wrench jaws. Fixture design requires special considerations

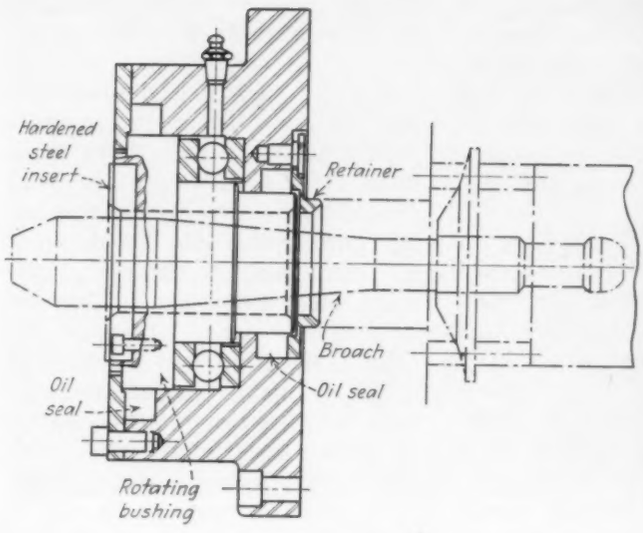


Simple faceplate bushing is the only fixture required for most internal broaching. It provides a flat surface against which the part bears and a hole through which the broach passes. Face of bushing is often counterbored to center workpiece. Bushing should be soft so there is no danger of tooth breakage if broach should contact it accidentally. Frequently the bushing is made with undersize clearance hole, and carburized all over. Hole then is rebored to proper size, removing the hardened surface and leaving the bore soft

curacy can be obtained. Broaching capacity must always be sufficient to prevent stalling or jerky operation during the cutting stroke. A 15-ton machine costs but little more than a 10-ton machine, for example, and it is better to have too much than too little broaching force available. Length of stroke also is an important consideration when selecting a machine; the stroke can be shortened when necessary by resetting control stops, but it cannot be lengthened beyond that provided on the machine.

Bathtub fixture developed by Michigan Broach Co. for broaching bores of long thin-wall steel tubes permits immersing work and broach completely in coolant. This helps carry coolant through long piece and keeps work cooler. Bronze bushing at outer end of fixture restricts flow of coolant out of tub around broach, and flow of coolant into tub is sufficient to keep workpiece covered

Centering bushing in faceplate fixture is step bored to hold workpiece central with ram and puller. Set up on an Oilgear XL-12, 16-ton horizontal machine, this fixture is used for finishing a 1⅛-in.-dia. solid-key hole in a 8 15/16-in.-long bronze cone gear sleeve. For this job, four 57-in. strokes are taken, using different broaches for each pass, and production averages five completed parts per hr.

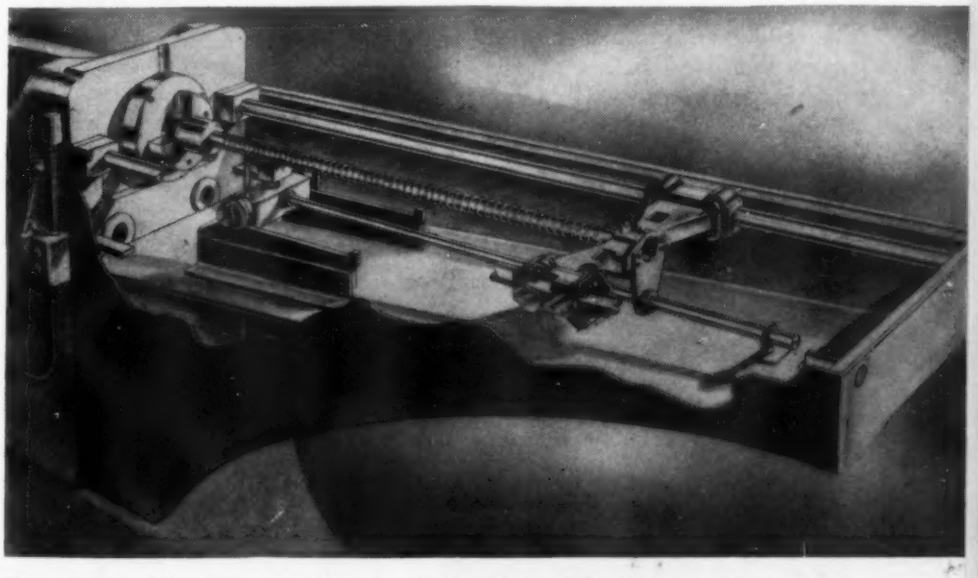


Ball-bearing faceplate bushings are sometimes used when broaching helically splined holes having relatively low helix angles. **Bushing permits workpiece to rotate easily so splines follow lead of broach teeth as broach is pulled through part. When helix is more than 8°, solid bushing is used, and broach is turned by a drive unit on puller**

Double-broach pullers can often be used on single-ram machines for simple internal jobs. Setup shown was tooled by Continental for finish broaching two steel bushings at each stroke. Faceplate adapter has two counterbored replaceable bushings to center the workpieces. Broaches are threaded through workpieces and into puller by hand

Most modern horizontal-broaching machines provide infinitely variable broaching speeds up to 30-40 fpm., with high ram return speeds. Some machines, for broaching aluminum, have been made with broaching speeds up to 60 fpm. A generous flow of cutting fluid at low pressure is important for most operations. On internal work, fluid must reach underside of broach. Straight, soluble and chemical cutting fluids may be used. Chlorinated and sulphurized oils are used for heavy cuts, or when fine finishes are important.

Any material that can be machined by other methods can usually be broached. Chill spots and sand inclusions in castings should be avoided as they dull the broach rapidly, and sometimes the uneven strain imposed by a hard spot will cause a broach to snap. Scale should be removed from castings and forgings by shotblasting or pickling. Locating faces on previously machined parts should be checked for position and smoothness. Burrs often cause mislocation of the part in the fixture. Diameter of the starting hole must be large enough to prevent the front pilot from jamming in the hole and putting an excessive load on the first broach tooth. A common difficulty when broaching forgings or castings is the removal of excess stock. Broaches are designed to remove a specified amount of material with each tooth, and trouble is to be expected if that amount is exceeded on the first tooth. Heavy-land bumper teeth are sometimes used for removing excess material or for cutting under surface scale.



Manual broach-handling mechanism developed by Colonial Broach Co. Conventional horizontal machine equipped with follow-rest has adjustable forward broach support which drops out of way on cam track as broach moves forward into work. Sketch also shows how workpiece is centered in counterbored adapter bushing bolted to faceplate of machine

Design of Fixtures

Design of fixtures for broaching operations calls for considerable experience if the factors involved

are to be balanced so they will make possible high production rates at low unit cost. The part to be broached, the machine available, and the production required all must be considered. Usually some fixture is needed, with the design ranging all the way from simple faceplate locators for internal or hole broaching to complex clamping arrangements for surface finishing. To take advantage of the high-production possibilities of the broaching process, fixtures must be arranged for easy loading and unloading. Care also must be taken that chips will not lodge in the fixture, particularly around supporting blocks, locating pads, and clamp operating mechanisms. It is especially important that surface broaching fixtures be designed so the part is held firmly and cannot come loose during the cut. At the same time, the part must be held in such a manner that it will not be distorted during the cut and then spring out of shape when released. Design should permit free flow of cutting fluid to the broach teeth just before they contact the workpiece.

Fixtures must be designed so broaching pressure is always directly in line with the center of the ram and broach puller. Also, the follow-rest, if used, must be in alignment with the broach throughout its travel. Machine maintenance to hold wear of ways, etc., to a minimum is essential if accuracy is to be maintained.

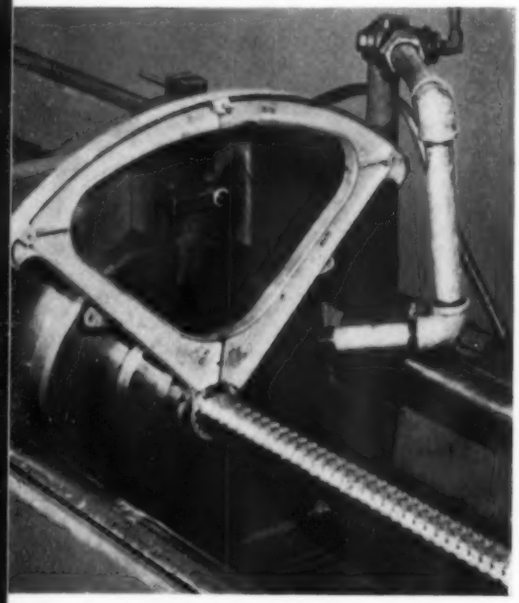
Wear Pads Needed

Surfaces of the fixture which come in contact with the workpiece should be removable hard steel pads which can be replaced easily should wear occur. Often it is a good idea to provide adjustment of these pads to take up for normal wear.

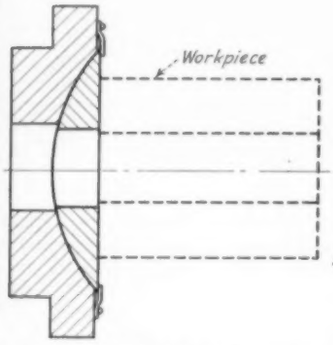
Clamps, when needed, should be designed for easy operation, and preferably should have some method of taking up wear. And the clamps, like other fixture elements, should be made strong enough to withstand rough handling. It is desirable in most cases for the clamps to be arranged so they can be withdrawn a considerable distance when released, leaving workpiece support and locating pads visible. This permits the operator to clean out easily any chips that may have become caught in the fixture, and also makes it easier to locate the next part for clamping. Manual and power-operated cam, screw and wedge clamps are used for horizontal fixtures in much the same manner as for vertical fixtures. All power - operated clamps should have a positive clamping action so any lowering of line pressure will not permit the part to work loose.

Support pads placed under the part to resist broaching pressure should be large enough to minimize coining of the part. They should be close to the surfaces being cut, and should be designed for easy replacement or adjustment when wear occurs. They are, essentially, wear plates, and should be supported adequately. Adjustable jacks or equalizing support pads are sometimes necessary to correct the irregularities of unfinished workpiece surfaces. However, finished surfaces should be used for location and support wherever possible.

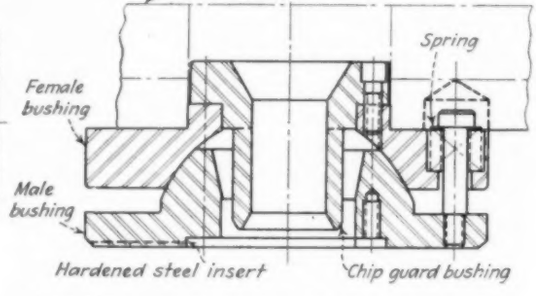
Locating pads are needed to align the surfaces to be cut with the broach. Preferably, these pads should be directly opposite the surface to be broached. Where this cannot be done, fixed locating pads are provided at the proper points and locking jacks support the workpiece opposite the surface being cut. Wherever possible, clamping pads should be provided opposite all clamps. When this is not possible, adjustable support jacks should be placed opposite the clamps. All support jacks must be locked in position so they cannot move under cutting pressure.



Radial location of square or splined holes is readily obtained by adding pins or locators to the faceplate of the broaching machine. In this setup on a 15-ton, 72-in.-stroke Colonial machine for broaching serrations in a steering quadrant, vertical bar holds horizontal pin which enters hole drilled near periphery of part

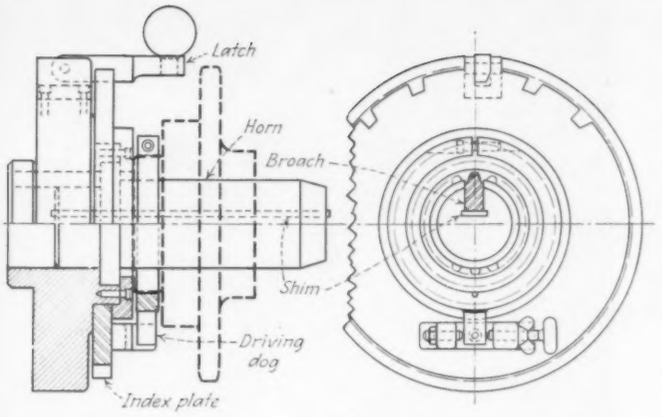


Hemispherical bushing resting in a mating cavity in special faceplate bushing is used by Detroit Broach Co. when hole in part is not square with face. This device permits broach to pull part into position so hole aligns with axis of broach. Four leaf springs hold bushing in place

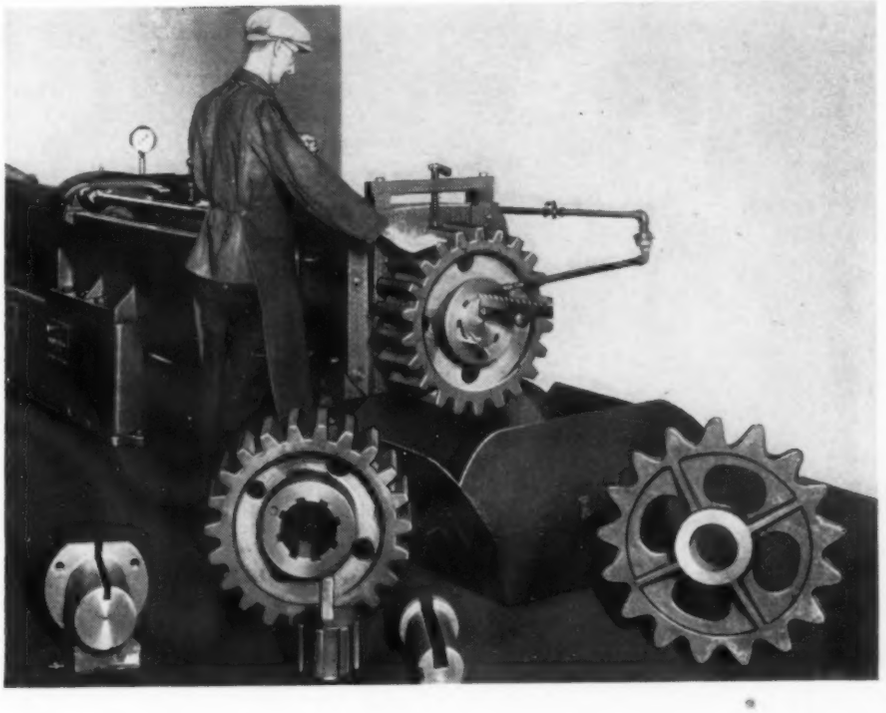


Equalizer developed by Michigan Broach Co. for use when thrust faces are not square with holes, has center of spherical bore on thrust face of male bushing. Design shown is for a pull-up vertical broaching machine. On horizontal machines, chip guard bushing should be reversed and attached to the male spherical bushing, so it extends through assembly past faceplate of machine. Three spring-loaded shoulder screws hold male bushing in place but permit it to shift under broaching pressure

Horn or plug-type faceplate fixtures are usually employed when cutting keyways. In this setup on a Colonial machine, horn fixture is used for broaching a straight keyway in a constant diameter hole. Special horns have been developed for angular keyways in constant-diameter holes, for straight keyways in tapered holes, and for keyways parallel to taper in tapered holes



Involute splines are broached in a steel sprocket with this fixture designed by Continental Tool Works for use on an Oilgear Machine. Horn fixture has index plate and latch to suit number of splines to be broached, and driving dog to connect workpiece with index plate. Adjustable stops on index plate lock driving dog to plate so first spline cut will have needed alignment with another surface on the workpiece

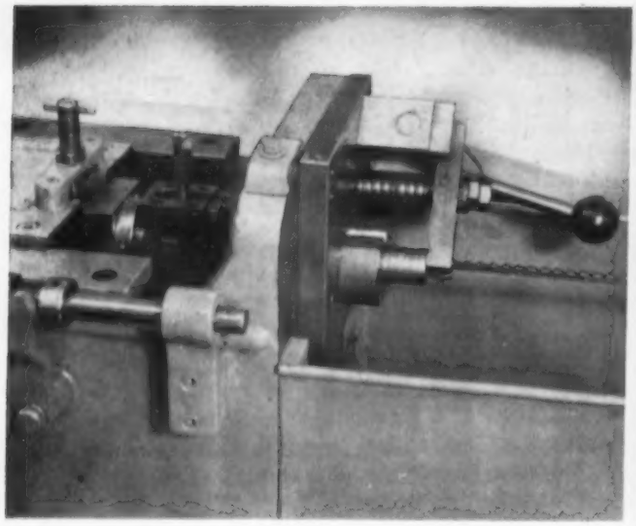


Straight-sided, multiple internal splines or keyways can be broached by indexing the part and broaching one spline at a time with a keyway-type cutter on small lots or unusually large parts. In this setup on an Oilgear 60-ton, 76-in.-stroke machine, the broach is guided in a deep slot in the horn fixture plug and it is shimmed between cuts. After each spline has been cut, part is turned on the horn until slot lines up with a keyway groove in the horn. A hardened key is then inserted and locked so work will not shift while broach is cutting next spline

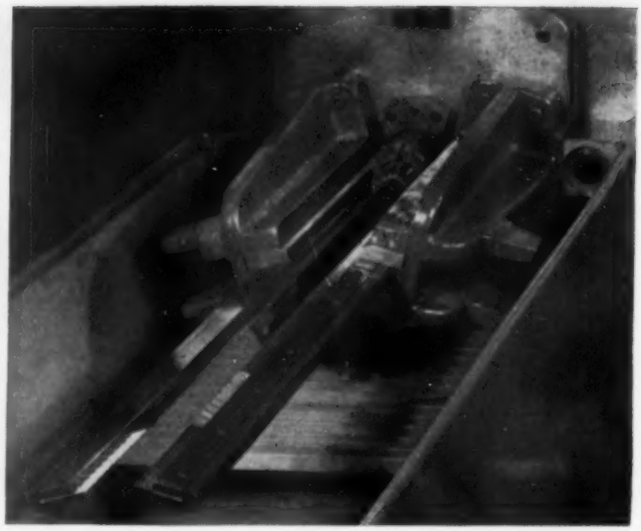
All fixtures must be sufficiently rigid to prevent springing under pressure of the cut. Likewise, holding clamps must retain the piece in the fixture throughout the cut, even if an unusually heavy load is encountered. Movement of the workpiece during the cut is certain to result in damage to the part, the fixture, and the broach. It is just as important, when starting a broaching cycle, to make certain that the piece is firmly seated in the fixture. Should the part "jump" into full contact with the fixture while the broach is moving, the part will jam against the broach and tooth breakage is almost certain. In the case of a hole broach, the broach itself may be broken off. It is equally important that the broach not be returned to the starting position until the workpiece has been removed from the fixture. Unless the part is removed, the end of the returning broach may strike the end of the part, with dulled or broken broach teeth, a damaged part or a broken fixture as the result.

Fixtures for Internal Broaching

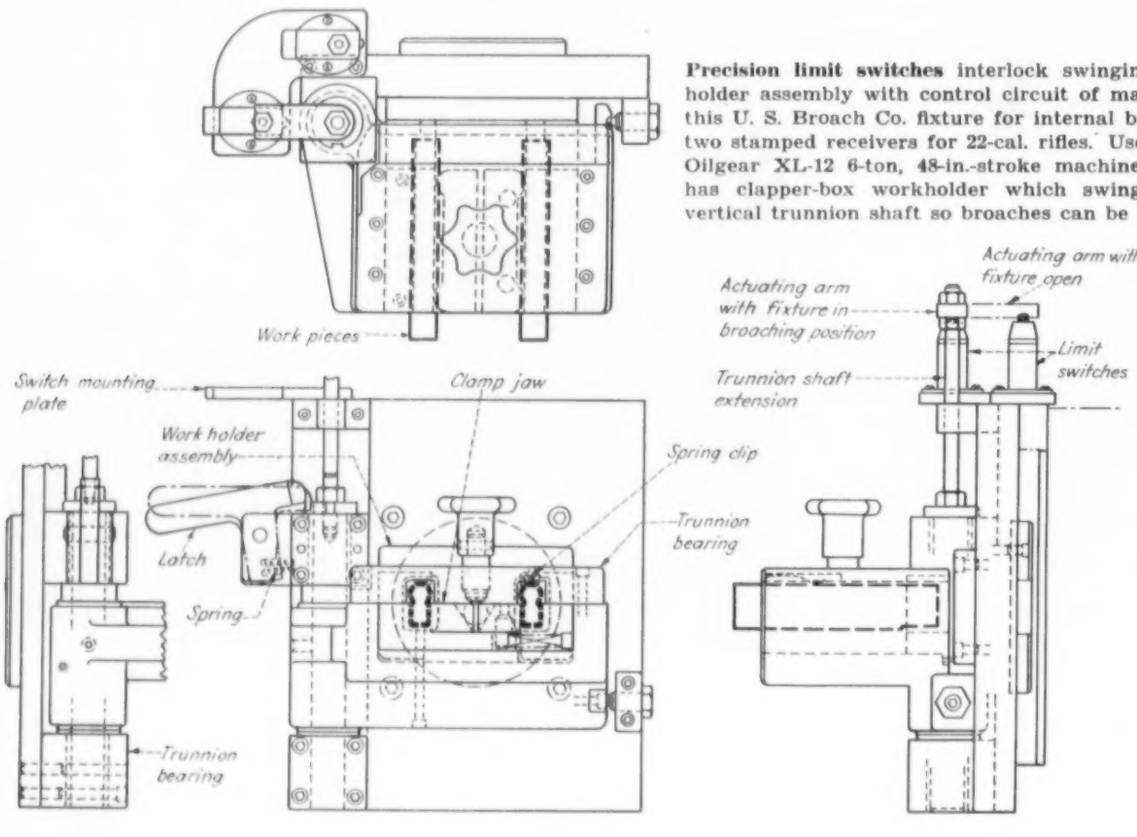
For most operations, a simple faceplate bushing is all that is needed in the way of a fixture. Cutting pressure is distributed evenly around the circumference of the hole, so the part is held automatically against the flat face of the bushing and no clamps are necessary. Pins or locating blocks can be added where radial location



Hand-clamped fixture used on an American H-2-30 horizontal broaching machine, permits broaching keyways in a number of thin parts simultaneously. A stack of workpieces is loaded over the fixture horn and properly aligned. Then the cam lever is turned to clamp the parts



Long broach-support brackets lined with hardened steel plates is used for slotting hydraulic pump rotors. Each 0.0780-0.0785-in.-wide slot has a 0.093-0.095-in.-dia. hole in bottom. Slots and holes are roughed and finished in two passes on a Colonial 10-ton, 60-in.-stroke machine

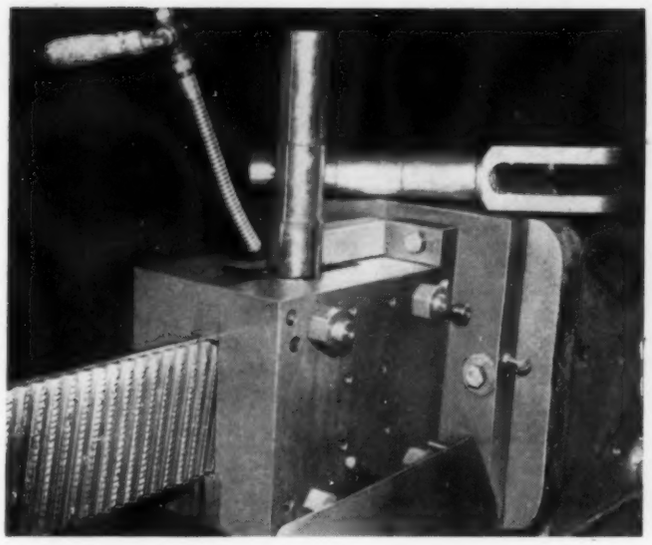


Precision limit switches interlock swinging workholder assembly with control circuit of machine in this U. S. Broach Co. fixture for internal broaching two stamped receivers for 22-cal. rifles. Used on an Oilgear XL-12 6-ton, 48-in.-stroke machine, fixture has clapper-box workholder which swings about vertical trunnion shaft so broaches can be returned

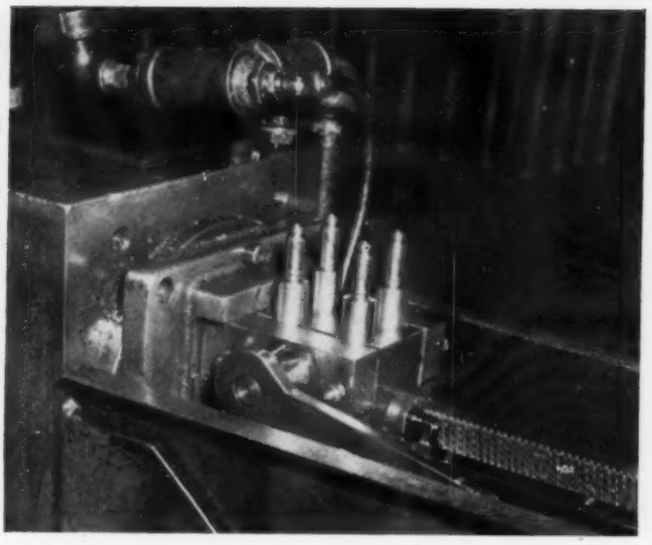
of the workpiece is necessary, as when broaching some square, splined or serrated holes. The hole in the bushing should be left soft, so danger of tooth breakage will be minimized should the broach accidentally contact the bushing.

The bearing face of a soft faceplate bushing will sometimes require reworking, because pressure of the parts against this face, caused by broaching force, will result in a coined surface or a depression. If this is objectionable, a hardened steel pad can be inserted in the face of the bushing. The hole in this hardened pad, left for the passage of the broach, should be larger than the hole in the bushing itself, so a dropped broach will strike the bushing and not the pad. Usually, the pad should not be harder than 45 Rockwell C.

When broaching the bore of a round part, the faceplate bushing is sometimes counterbored to as-

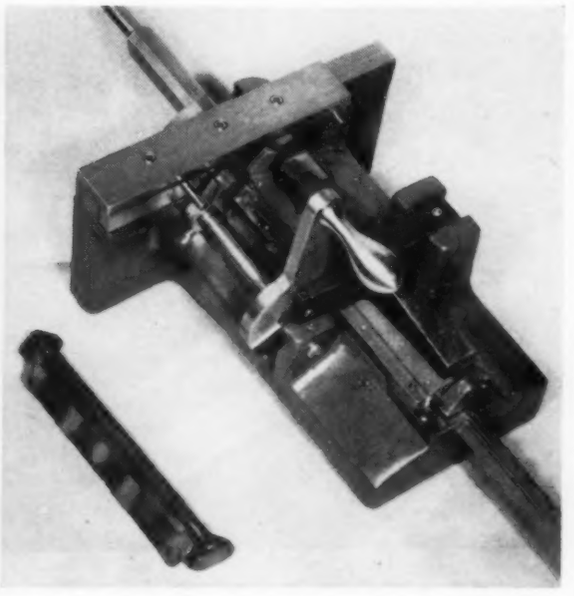


Steel shock-absorber forks are set vertically in this box fixture for surface broaching inner faces after slot has been rough machined. Construction of fixture, shown set up on a Lapointe Type L horizontal machine, insures accurate guiding of broach bar during heavy cut



Hand lever operates screw clamps to lock four shafts in this box fixture so flat can be broached on side of each part during one pass of the two heavy broaches. Designed by Continental Tool Works, this fixture has rectangular broach guide holes lined with hardened steel wear strips

Open-slot fixtures of this type can be used when broaching load is equal on both sides of a part. They are easy to load and unload, and cost less than clamp-type. Devised by Detroit Broach Co. for use on an Oilgear, 5-ton, twin-ram machine with 36-in. stroke, they are used for cutting grooves in sides of fuse plugs

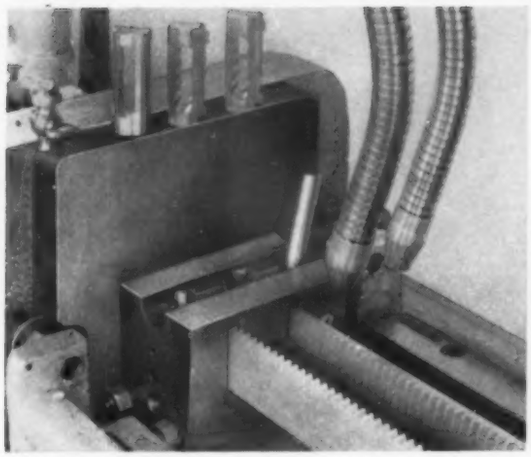


Simple, hand-operated hook clamp holds adding-machine part horizontally in this fixture made by Continental Tool Works for broaching long, narrow slot in base of part. Broach bar is guided throughout cut so required accuracy is insured

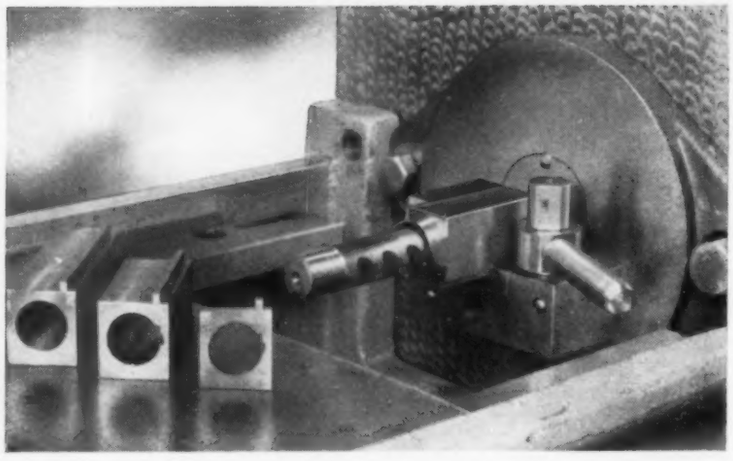
sist in aligning the workpiece with the centerline of the broach puller. Clearance between the workpiece and the counterbore of the bushing, in such cases, should be as small as possible without making it too difficult to insert and remove the workpiece.

It is very important that the hole to be broached be square with the face of the part which rests against the faceplate bushing. Unequal strains caused when the face is not square with the hole will often result in a broken broach, or a torn surface inside the hole. Where it is impossible to provide a square bearing surface for the part, as when broaching from a cored hole in a casting or a forging, an equalizing fixture is important. Such a fixture usually consists of a hemispherical bushing which rests in a hemisphercial cavity in the faceplate adapter bushing. Pressure of the broach against the workpiece is sufficient to move the bushing to the position where the axis of the hole coincides with the axis of the broach, insuring an even cut in the bore of the part.

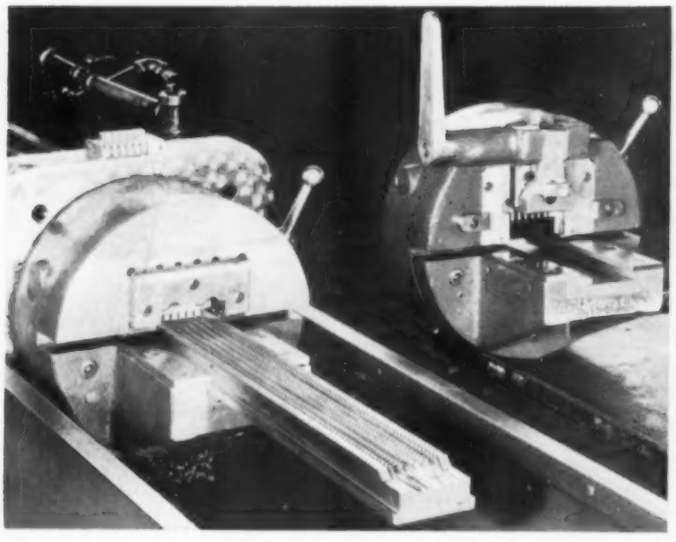
Helical- (or "spiral") spline broaches usually start in holes drilled or reamed to size and generate the tooth shape in the same manner as straight spline broaches. However, the helical-spline broach can often be provided with round sizing teeth to finish previously



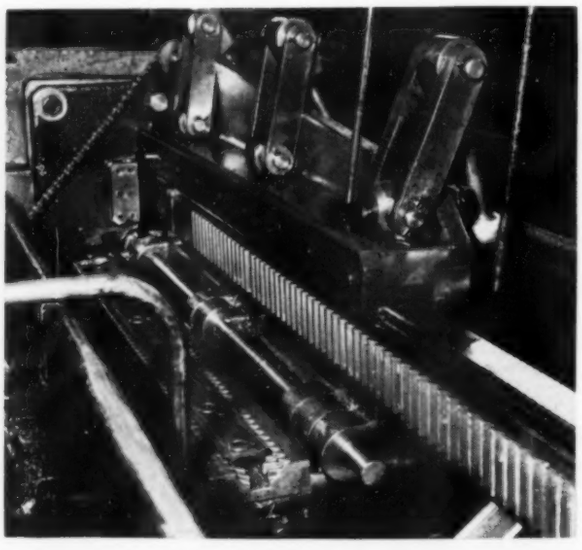
Single, hand-operated cam locks two forgings in this faceplate fixture for broaching rectangular opening from a series of drilled holes. Two broaches are pulled side-by-side in Lapointe machine. Each finishes half the hole and one part is completed with each cycle. Part finished at right-hand is transferred to left-hand side for second cut



Hand-clamp on this Lapointe faceplate fixture holds forged steel rifle receiver chamber for internal broaching operation. Broach cuts full periphery of hole during first portion of stroke, then cuts key grooves in one side with finishing teeth. Clamp is necessary because of unbalanced load on part during latter portion of stroke



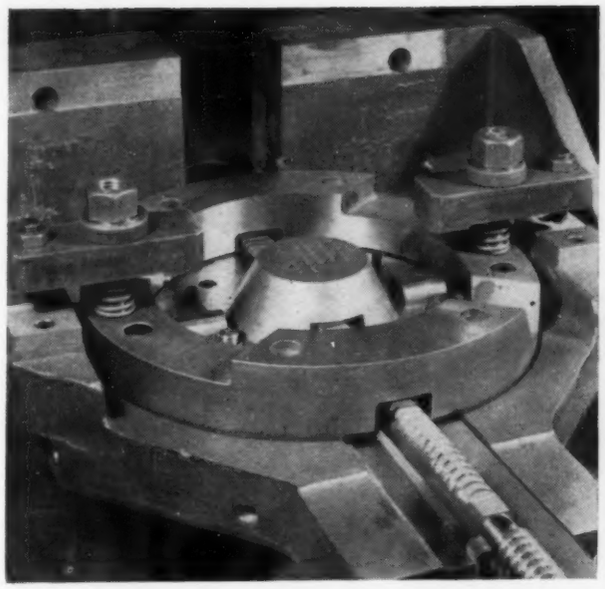
Two fixtures developed by Continental Tool Works cut grooves in two sides of brass parts. Eight narrow grooves are cut in one pass, using fixture at left. When lot of parts has been finished with this setup, fixtures are interchanged and seven additional grooves are cut in second face of part. Tolerances are ±0.0002 in. Broach guides are lined with hardened wear plates



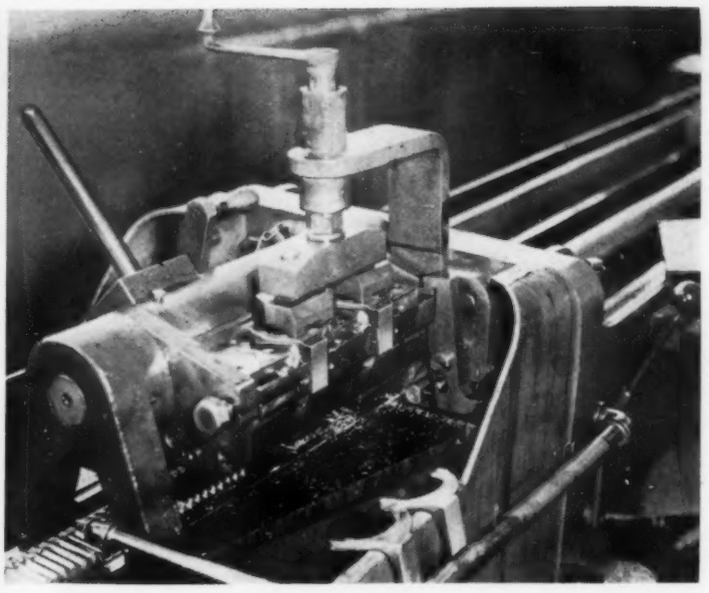
Long part for harvesting machine is surface broached on back face with this heavy leaf fixture made by Continental Tool Works. Broach bar is guided in back section of fixture. When part is loaded, as shown, leaf is swung up by hand and locked in place with three clamps

drilled or reamed holes. Where the lead of the helix is less than about 8° it is usually possible to use a ball-bearing puller, in which case the broach revolves, or a ball-bearing fixture, so the work will revolve. In such operations the front teeth of the broach serve as guides for the following teeth, and the broach, or the work, as the case may be, revolves of its own accord to generate the correct helix in the work. When the helix angle is greater than 8°, however, a lead-screw or other turning device must be added to the machine to assure positive rotation of the broach. In such cases, the work is held stationary in the faceplate fixture. In helical spline broaching, it is important to keep backlash and wear of the broach drive-head and lead-bar at a minimum.

When broaching keyways with a conventional keyway broach, a horn-type fixture bushing is usually employed. The horn consists of a round piloting portion slightly smaller than the bore of the workpiece. Behind the horn is a flange which rests against the faceplate adapter bushing. A ground diameter on the back of the flange fits snugly in the bore of the adapter bushing. A slot, parallel to the axis of all three diameters, is cut in the horn to guide the broach inside the workpiece. Usually, adapters are hardened and ground.

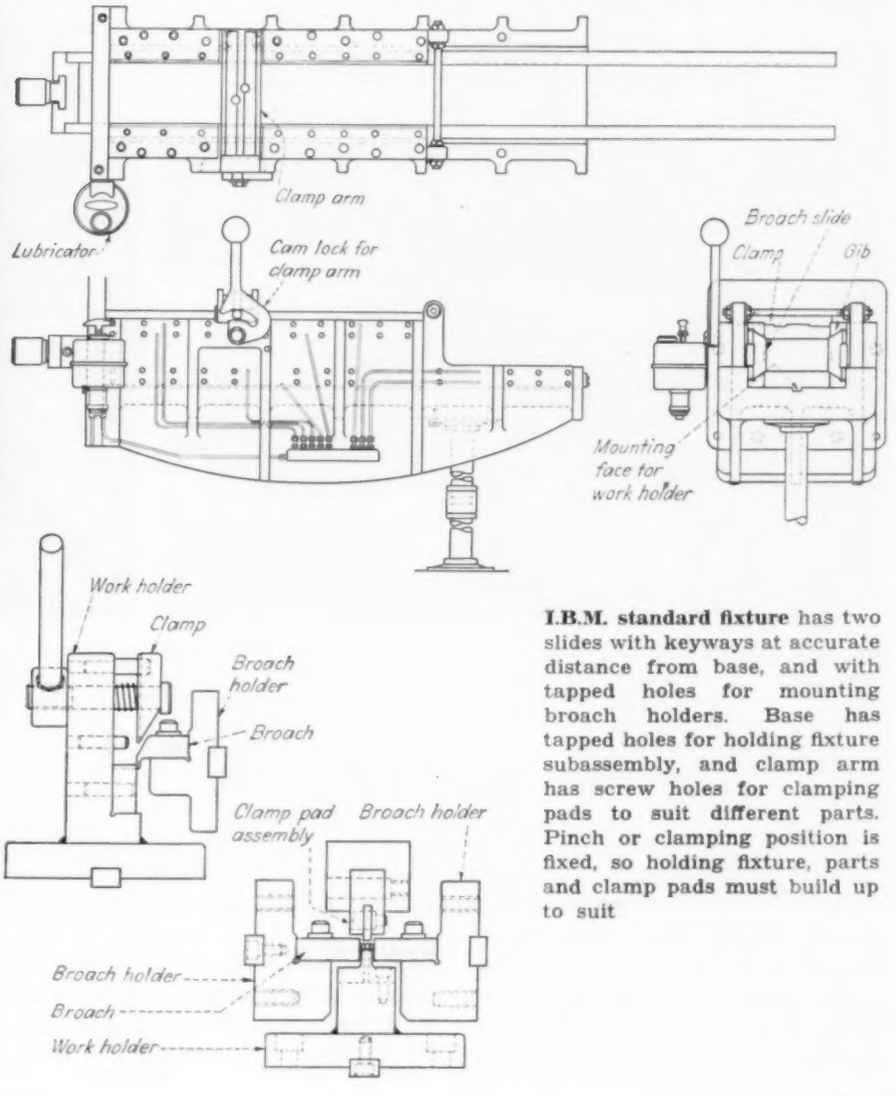


Manually operated fixture designed by Detroit Broach Co. is used for broaching half-rounds in face of differential housing. Clamps are swung 90° to clear part when loading or unloading, and are tightened with hand wrench. Tapered plug and taper-bored nest ring centers work. Removable indexing plugs insure accuracy of location of part for second cut

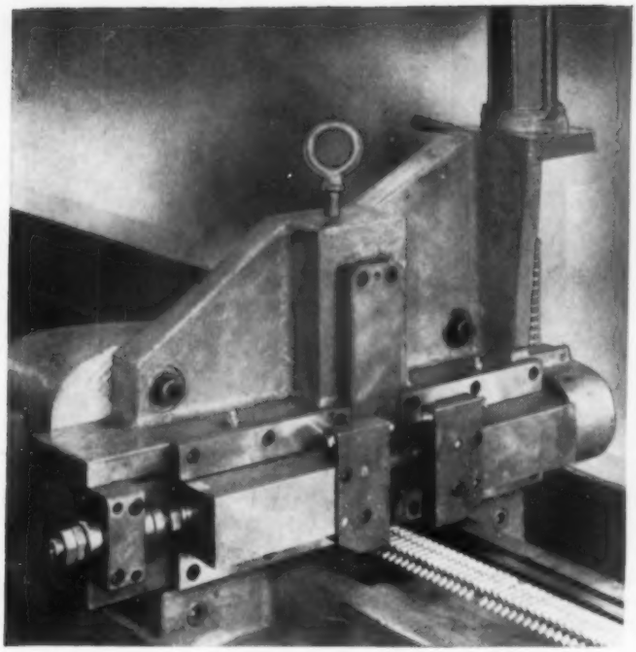


Two shifter forks for an auto transmission are surface broached at each pass of this 15-ton, 72-in.-stroke Colonial machine. For easy loading while broach holder is returned, trunnion-type fixture is used. Raising trunnion by hand to clear broach teeth brings clamp nut against end of socket wrench held vertically in bracket extended over fixture from faceplate

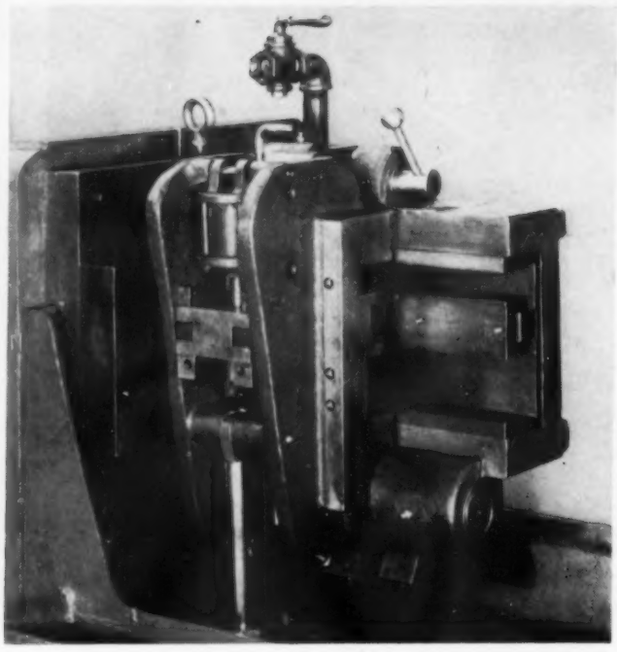
Standard broaching fixture developed at International Business Machines' plant in Endicott for economically broaching parallel surfaces on small parts. It eliminates necessity for making complete fixture for each part. Made in two sizes, with 18- and 36-in.-long bodies, fixture includes broach slides, fixture body, and clamping arm. Holding units, broach bars and inserts, locators and clamp pads are made for different parts at considerable saving in tool cost. Clamp arm swings over holding unit, and is held in place with cam hook lock



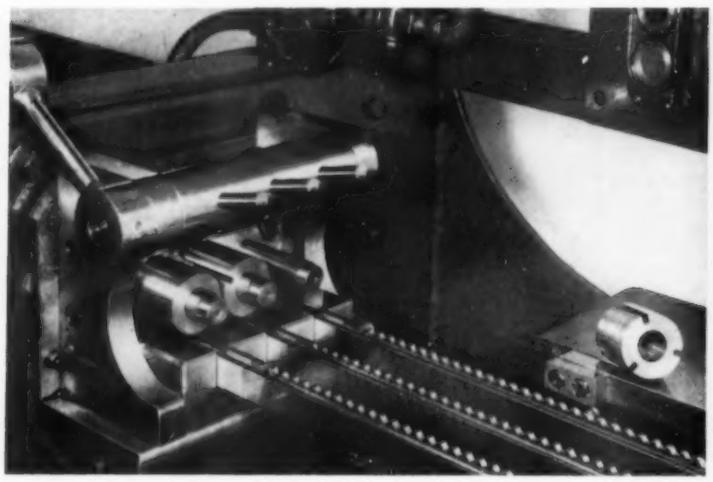
I.B.M. standard fixture has two slides with keyways at accurate distance from base, and with tapped holes for mounting broach holders. Base has tapped holes for holding fixture subassembly, and clamp arm has screw holes for clamping pads to suit different parts. Pinch or clamping position is fixed, so holding fixture, parts and clamp pads must build up to suit



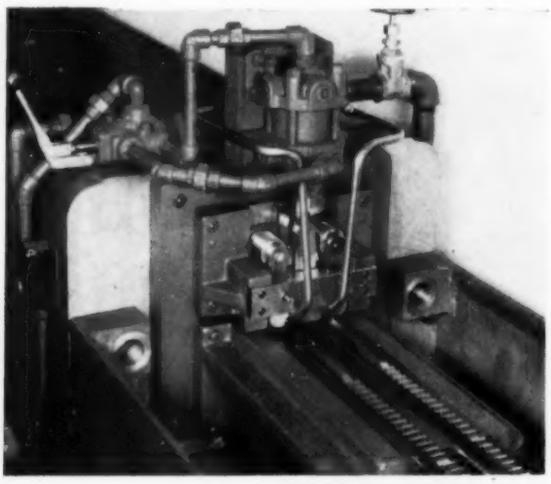
Air-operated equalizing fixture for use with 90-in.-stroke Colonial machine holds turbine rotor blade for broaching dovetail slot in root end. Entire dovetail and end fit is completed from the solid in three setups on this machine, using built-up sectional broaches for each operation. Air cylinder moves rack to turn clamp operating screw, which has right- and left-hand threads. Broach guide in lower section of fixture is lined with hard steel wear plates



Stationary, air-actuated fixture for slab broaching two turbine rotor-blade blanks at a time was designed for use on 15-ton, 90-in.-stroke Colonial machine. Air cylinder under fixture opens and closes clamp arm which swings on lower hinge pin. Small air cylinder in swinging arm pulls spring-loaded clamp members against wedge near center of arm to lock blanks in place. Hand-operated latch holds arm in clamped position during cutting stroke



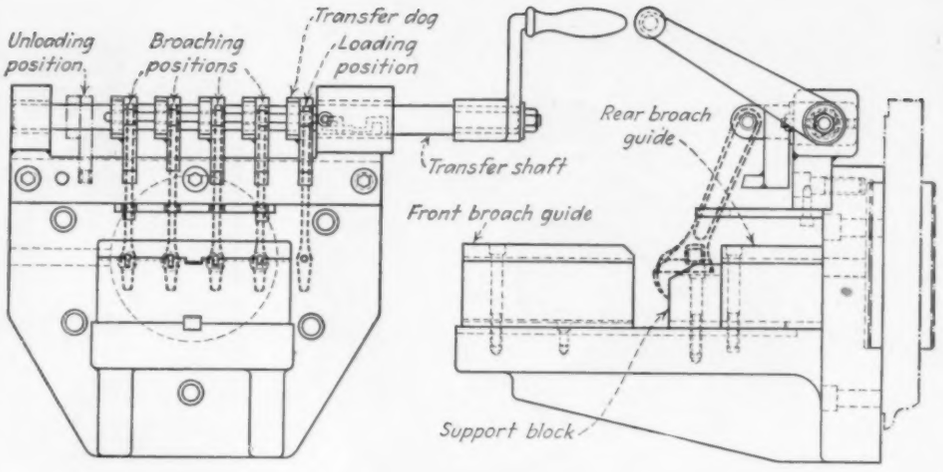
Three equally spaced slots 0.210-0.213 in. wide are broached down the length of alloy-steel cylinders in this fixture developed by Apex Broach Co. Studs on swinging overarm brace work supports against flexing under broach pressure. Slots are broached progressively and stationary index pawls are arranged so there is no accumulation of spacing errors. Production is 80 complete parts per hr.

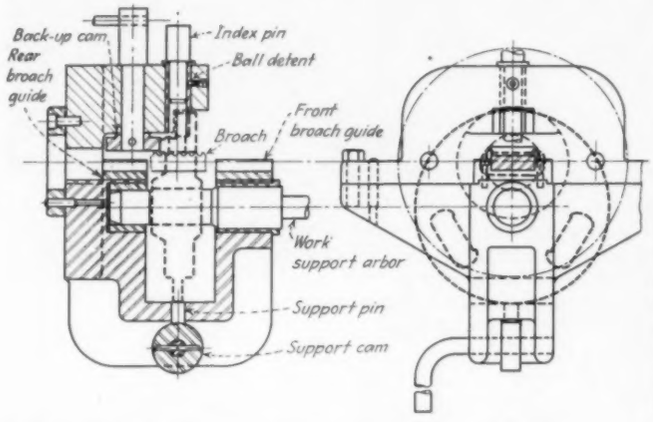


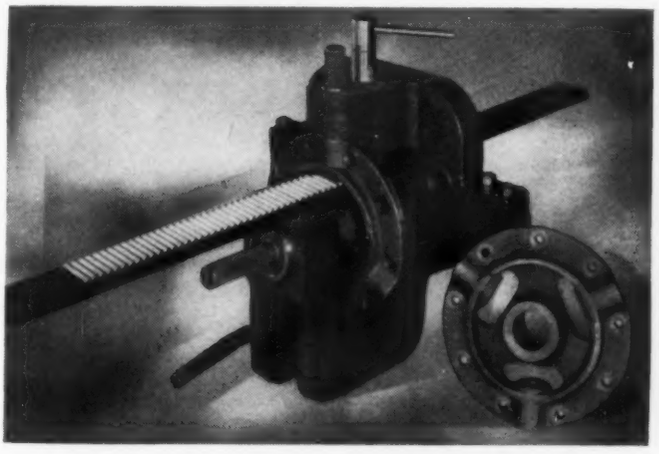
Long grooves are broached with this hydraulically operated fixture on a Colonial 15-ton, 72-in.-stroke machine. Part is located in left-hand side of fixture and groove is cut to half depth. Then it is moved to right-hand side for second pass. Cams on slide actuate valves to control cylinder which operates clamps by pulling wedge between rollers

Deep keyways can be cut by making several passes of the broach, adding shims between the broach and the horn after each stroke until the required keyway depth is reached. More than one keyway can be cut in the bore of a part with a horn-type fixture. For such jobs, indexing slots are cut in the horn parallel to the broach guide slot. After each keyway is broached, the next keyway position is aligned with the broach by turning the part on the horn until the cut keyway and a groove in the horn are aligned. Then a hardened key is inserted to hold the workpiece against rotation while the broach is cutting. This method is used for broaching large splined holes where production re-

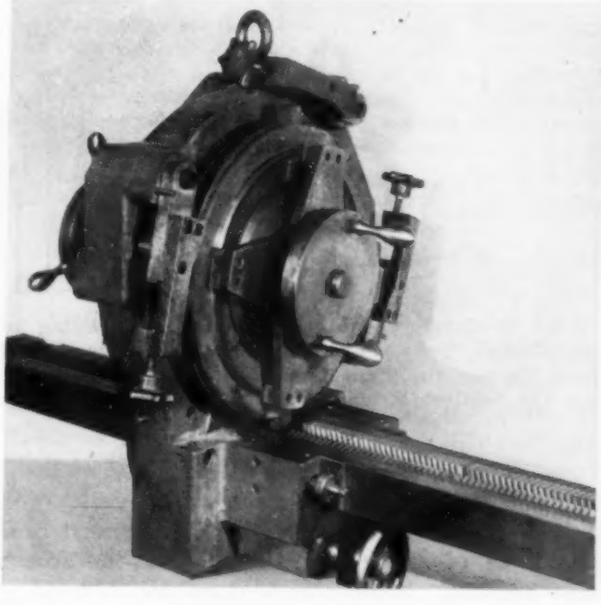
Sliding-jaw slots in handles of adjustable wrenches are broached from round starting hole with this fixture developed by U. S. Broach Co. for use on an American H-6-36, 6-ton, 36-in.-stroke machine. Transfer device raises and moves workpieces progressively across fixture while broaches are being returned by automatic handling device. Front and rear guides support broaches on non-cutting round sections. At end of each cycle, handle of transfer device is turned to raise workpieces and move shaft one position across fixture. Finished part at left is removed and handle is lowered to drop parts into slots at broaching stations. Shaft then is returned and new part is loaded onto first transfer dog.



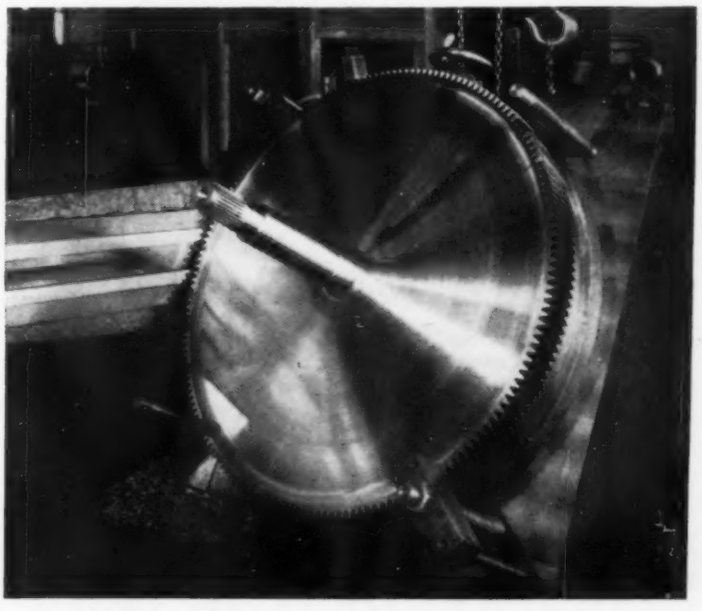




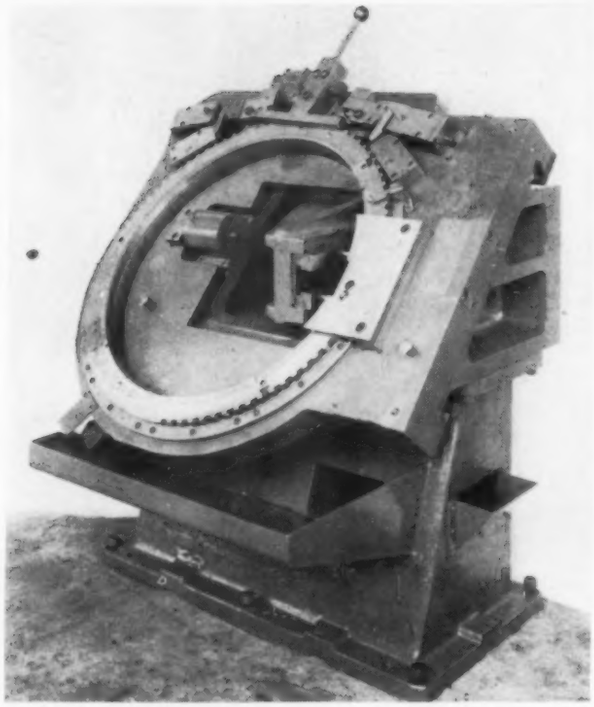
Differential carrier for tractor has faces of three gear-shift pads surface broached on this fixture developed by National Broach & Machine Co. Workpiece is centered on heavy arbor and located with vertical index pin. Two cam clamps support part during cut. Broach is guided in front and rear slots lined with hard steel plates



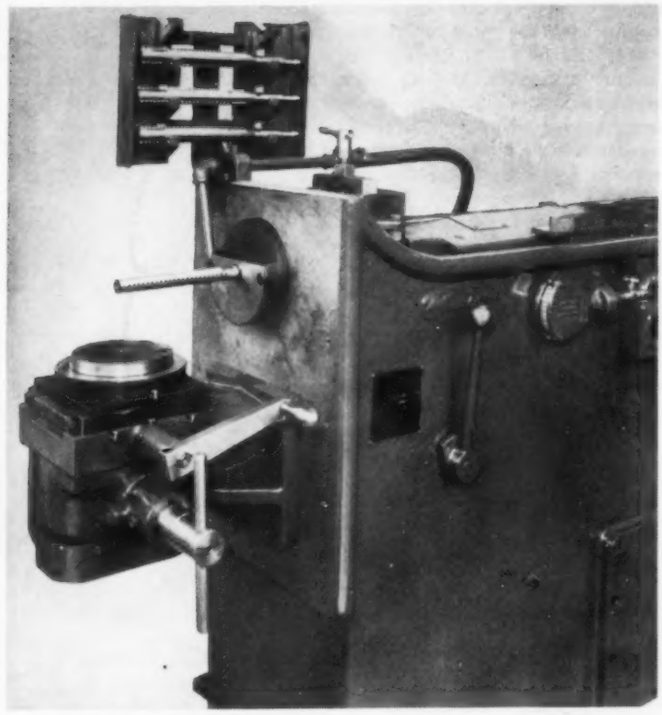
Manually operated indexing fixture designed by Detroit Broach Co. for finishing sides of four lugs on periphery of large steel tractor clutch plates by surface broaching. Three screw clamps around faceplate of fixture engage the three lugs out of broaching position. Guide plates for broach bar are tapered for easy adjustment



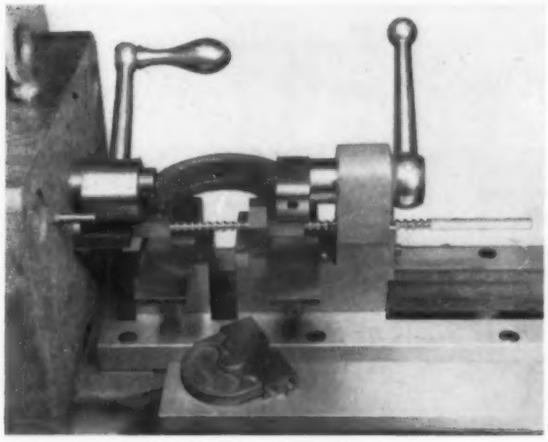
Turbine blade slots in rotor disks are broached in a hand-indexed fixture designed by Detroit Broach Co. Fixture includes long broach bar guide with hardened and ground steel wear strips for accuracy. Work is held by four clamps. Similar fixtures have been made with automatic indexing and automatic traverse for broach relief during the return stroke

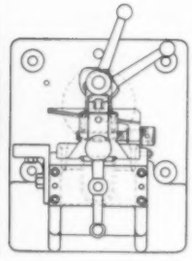


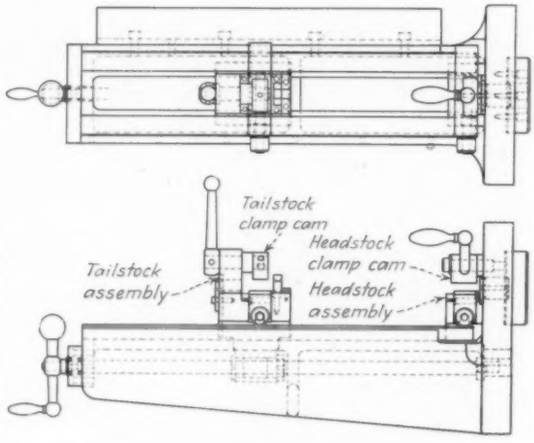
Automatic indexing and hydraulic broach relief during return stroke is featured in this Detroit Broach fixture for cutting blade grooves in stator rings for gas turbines. Designed for use on a horizontal machine, fixture has reversible indexing mechanism so holder need not be turned through 360° when cutting half rings



Unusual fixture developed by American Broach & Machine Co. for producing two splines in a series of holes. Since the holes are blind, a series of short pull broaches were used. Part is located from counterbore, and a lever mechanism aligns the holes in the part with the broach puller. Machine is American H-6-36 horizontal unit







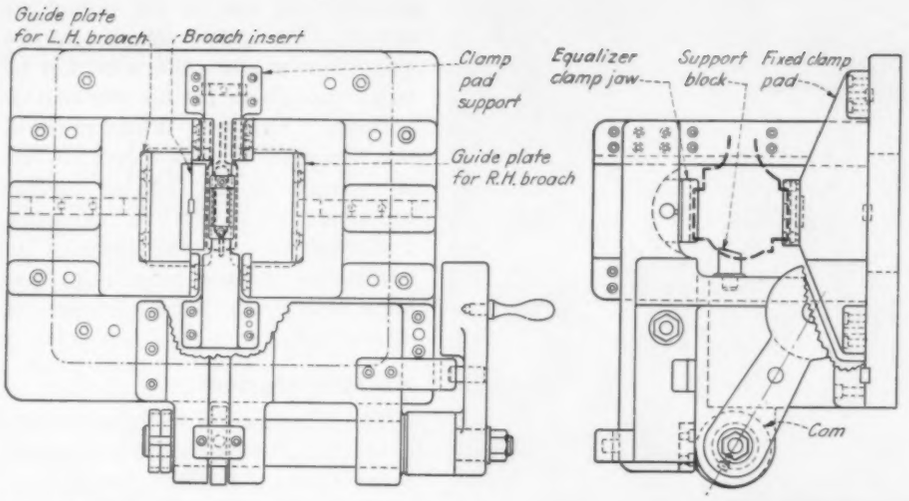
Adjustable fixture, developed by Lapointe for broaching square holes in snap gage frames, uses hand-operated cam clamps to hold workpieces down against accurately positioned horizontal backup slides. Indicator rest plate in front of fixture frame permits precision setting of backup slides. Tailstock assembly has backup block and broach locator to align broach before cut is started. Ways for tailstock extend 27 in. from face of baseplate

quirements are too low to justify the cost of a large solid spline broach. Sizing broach can be pushed through the bore after the splines have been roughed out by the keyway method.

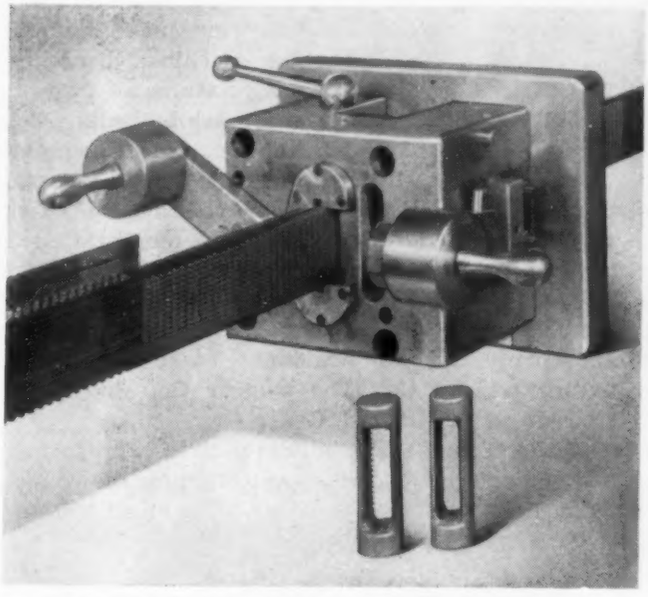
Horizontal Surface Broaching

Design of fixtures for the most part follows the principles previously outlined for fixtures in vertical surface broaching machines (*A.M.*—Vol. 92, Jan. 1 and 15, 1948). Each fixture must be of rigid construction to prevent movement of the part during the cutting stroke, clamping devices employed must hold the part in correct relation with the broach teeth throughout the stroke, and the fixture must permit easy loading and unloading of workpieces. In addition, the fixture must provide means for guiding the broach bar throughout its stroke, because the machine ways are not used for guiding the broach, as is the case with vertical machines.

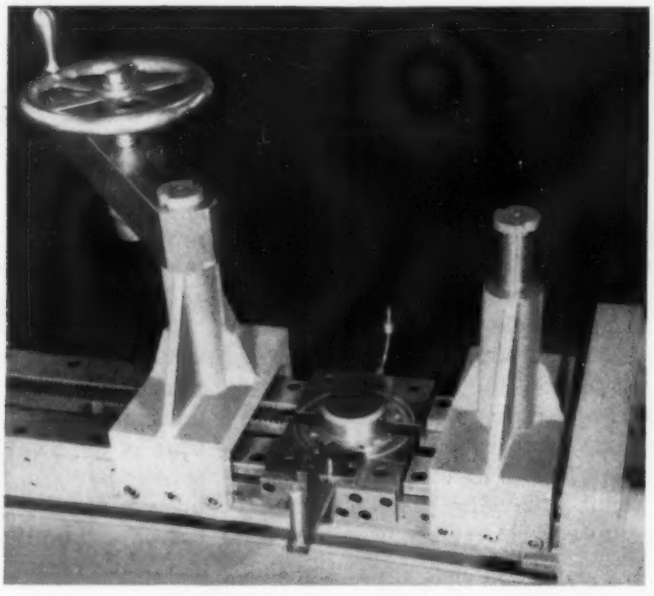
When designing guides for the broach bar, the principal consid-



Developed by U. S. Broach Co. for use on a No. 4L Lapointe machine, this hand-operated fixture has interchangeable clamp supports, clamp pads and support blocks for holding three sizes of connecting rod forgings so faces can be surface broached. Broach inserts are positioned on bars for different parts by using standard shims. Counterweighted lever on cam shaft makes it easy to lock or unlock spring-loaded clamp arm



Hand-clamped fixture made by National Broach & Machine Co. for cutting rack teeth in inside face of piston for automatic door closer is open at top for loading part between equalizing clamp jaws. Soft steel backups support thin sides of part against broaching thrust and are cut with broach after installation so support is provided at broached surfaces. Lower workpiece support swings out of way to permit broached part to drop out of fixture



Designed for use on an American HD-15-66 horizontal machine, this fixture holds differential housing halves for broaching four half-round holes spaced 90° apart for spider. Two operations are required. Production averages 38 parts per hr. at 85% efficiency

erations must be rigidity, length, and resistance to wear. The guides customarily are made integral with the workholding portion of the fixture, and are lined with hardened and ground steel wear plates. Sometimes these wear plates are tapered, like machine gibs, and have adjustment for proper alignment of the broach bar and to take up for wear. Close clearance must be provided between wear plates and broach bar, so the bar will slide freely without too much play. In many cases the length of the guides is equal to the length of the cut, but experience has shown that much longer guides are often superior. Sometimes the guides extend out from the faceplate for the entire length of the broach bar.

Some method for clamping the workpiece in the fixture is essential in almost all fixtures for surface broaching, and for those internal broaching operations where the cut is heavier on one side of the hole. Several methods for clamping workpieces are illustrated. These include hand, air and hydraulic operation of cams, levers and wedges. Also shown are a number of indexing fixtures which make possible improved production rates. Such fixtures may be operated either manually or automatically, and can be used either to index successive parts into broaching position, or to index the same part to a new position for a second cut.

Trunnion or tilting fixtures have been used to advantage to facilitate loading and unloading. Multiple-position fixtures, in which the part is positioned successively in several stations, have been used successfully for a number of internal and surface broaching operations set up on horizontal machines. They accomplish the same purpose

Special tunnel-type machine designed for mass-production work. In this setup, auto engine cylinder block is hand clamped in fixture which straddles broach slide on which cutter assemblies are bolted. Other machines have broaches in inverted position inside tunnel and work is pushed through with hydraulic ram or pulled by a chain

as indexing fixtures, usually are less expensive to make, and more rigid than the indexing type.

The ease of tooling with relatively simple fixtures, which are readily interchangeable on the faceplate of the machine, has led to the wide use of horizontal machines for relatively short-run jobs. This is especially true of internal broaching, where standard round and keyway broaches can be used for a number of different parts. In the same way, slabbing broaches can often be used for a wide range of jobs.

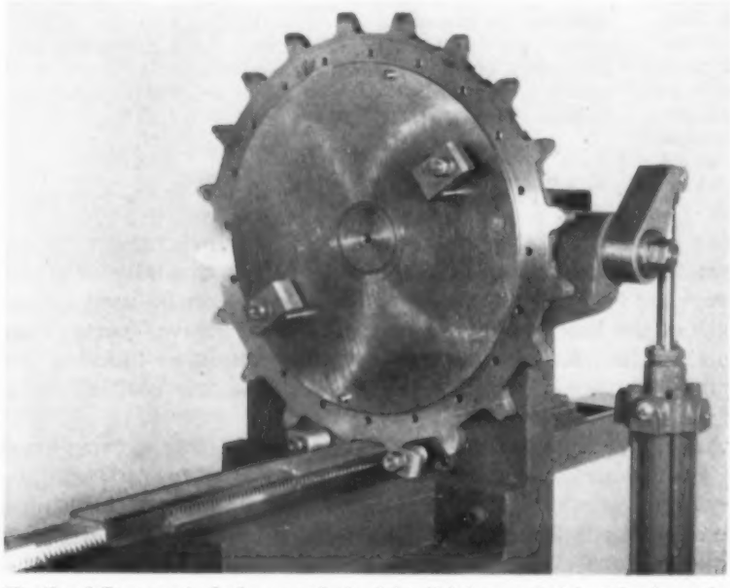
Most important among recent fixture developments probably is the multi-purpose fixture which holds a number of different parts, usually different sizes of the same type of part, for internal or surface broaching. Often, such fixtures for holding "families" of parts make possible the use of the broaching process for jobs where job-lot quantities would otherwise not be large enough to justify the cost of necessary fixtures. While most of the progress in this direction has been made in the field of surface broaching with vertical machines, a number of universal fixtures for horizontal surface broaching have been developed. Some of these are illustrated.

Acknowledgment

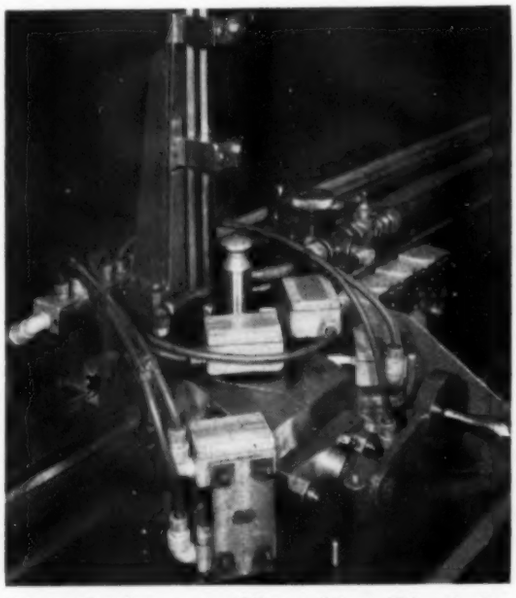
The information and illustrations contained in this report were compiled from a number of sources, including broaching machine users and the following manufacturers of broaching machines, broaches, and broaching fixtures:

American Broach & Machine Co., Apex Broach Co., The Cincinnati Milling Machine Co., Colonial Broach Co., Continental Tool Works Division of Ex-Cell-O Corp., Detroit Broach Co., The Foote-Burt Co., The Lapointe Machine Tool Co., Michigan Broach Co., National Broach & Machine Co., The Oilgear Co., and U. S. Broach Co.

The editors wish to express their sincere appreciation for the wholehearted cooperation of all of these organizations.

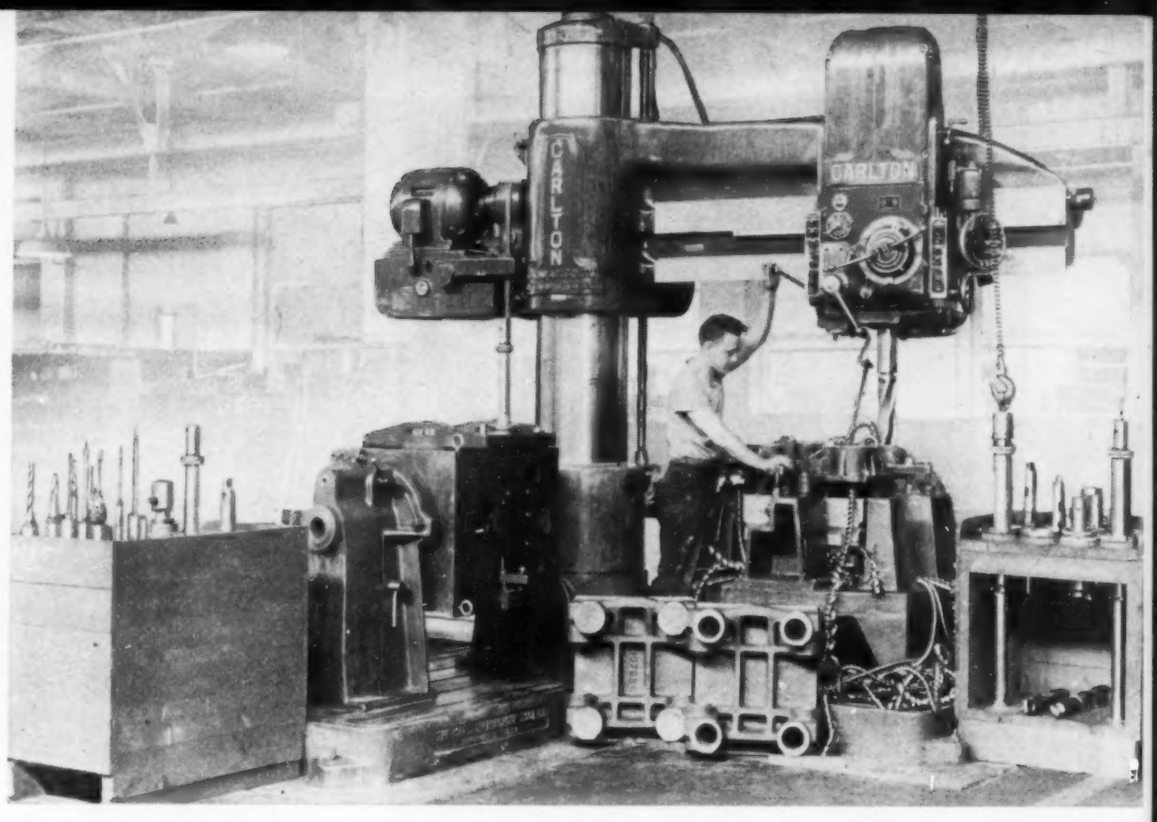


Teeth of flame-cut chain sprockets, 1 in. thick, are finished by broaching in hydraulically tilted, hand-indexed fixture on a 15-ton, 72-in.-stroke Colonial machine. Broach is in five sections, each section forming part of contour between tips of teeth. Workholder tilts about horizontal axis to clear broach and permit indexing during return stroke

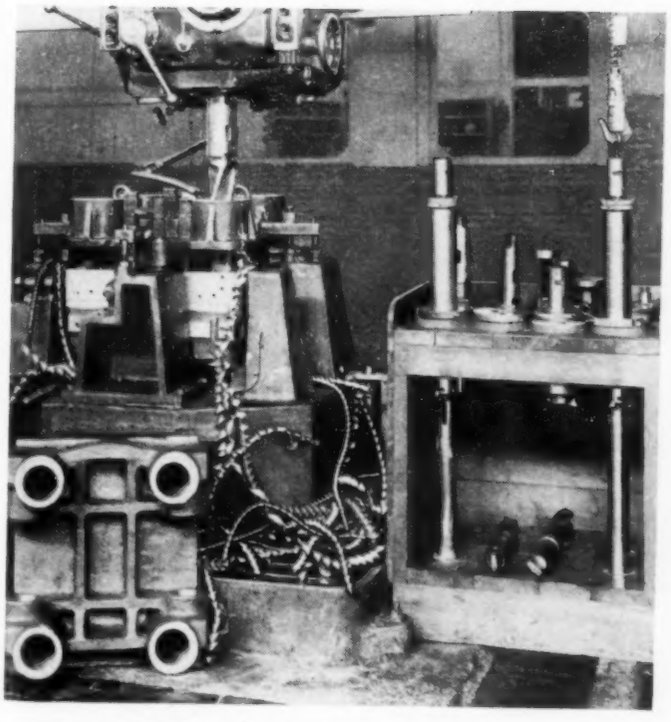


Unusual setup on an Oilgear 3-ton, 48-in.-stroke horizontal machine used to notch two magnet pole pieces and cut them to length from round stock fed vertically down into the fixture. Three broaches are mounted in heavy broach bar. Micro Switches interlock machine controls

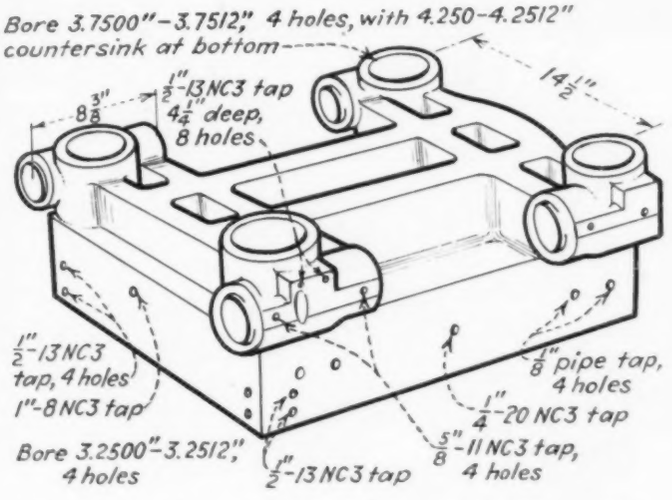
FLEXIBILITY Normally, a radial is set up with fixture on one base only, leaving the other free for momentary jobs. Quick-change chucks free the spindle similarly. Here, however, both the movable die plate (right) and the link cylinder plate (left) are set up on a 6-ft. Carlton radial. Tools for each job are kept in their own socketed cabinet, brought from the tool crib. Drilling and rough boring are at 60 to 65 sfpm., boring with carbide at 150 sfpm. Feed is 0.019 to 0.024 in. per rev.



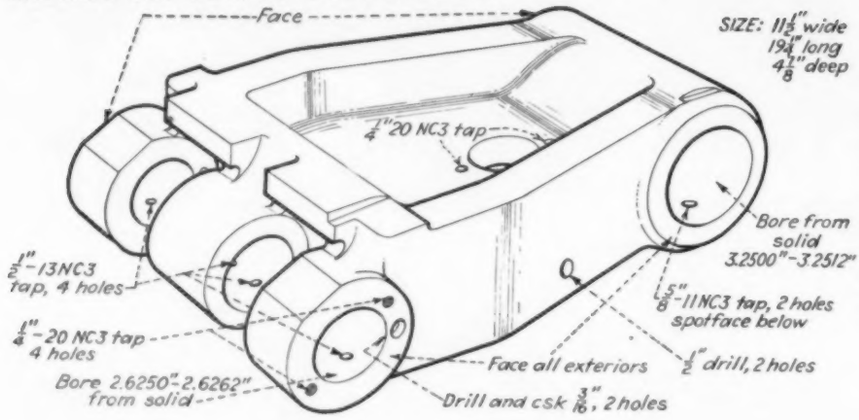
RADIALS CUT BORING COSTS 24.3%



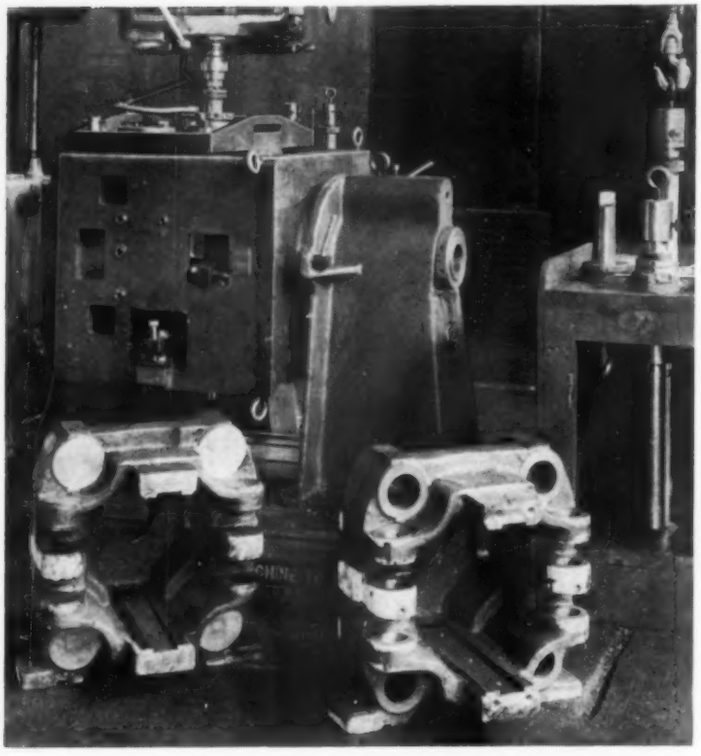
With suitable fixtures, Reed-Prentice Corp., Worcester, Mass., combined boring with drilling, tapping and facing on four injection-molder parts . . .Other production jobs are done, too

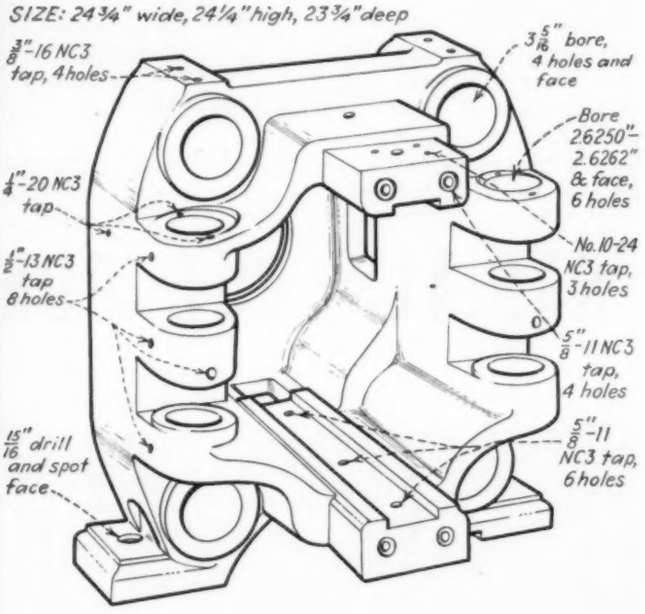

Bore 3.7500"–3.7512", 4 holes, with 4.250–4.2512" countersink at bottom
14½"
⅞"
1"-13 NC3 tap 4¼" deep, 8 holes
½"-13 NC3 tap, 4 holes
1"-8 NC3 tap
⅜" pipe tap, 4 holes
¼"-20 NC3 tap
⅝"-11 NC3 tap, 4 holes
Bore 3.2500"–3.2512", 4 holes
½"-13 NC3 tap

35% SAVING In the movable die plate, a heavy 12x21x25-in. steel casting, four 3¾-in. tie-bar holes are drilled, bored and countersunk from the face 4¼ in. dia. x ⅝ in. deep in this jig. Four 3¼-in.-dia. linkpin holes are drilled and bored the other way, all to be bushed later. Some 24 smaller holes are drilled and countersunk from the sides and most of them tapped. Saving over conventional boring and drilling in this case was 34.7%. Holes visible from one side are indicated in the sketch above

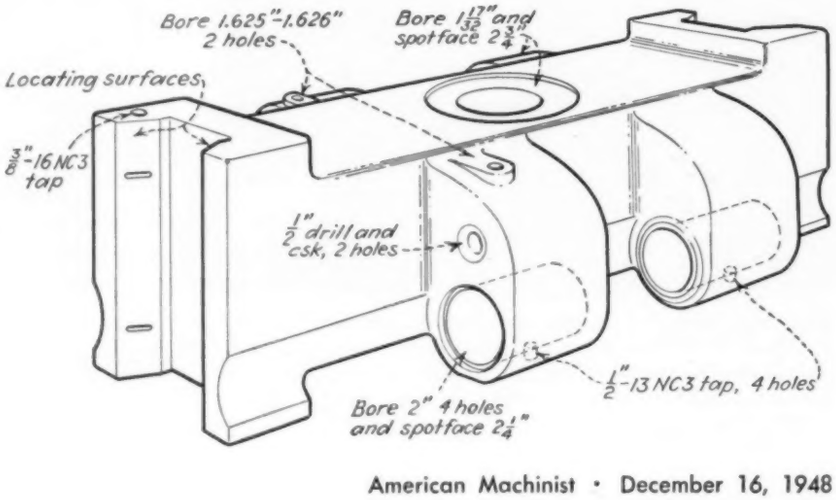


28% SAVING On the cast-steel front link, inside faces of one end have been milled on receipt. The two major lines of holes are drilled and bored. Twenty-two smaller holes are drilled and countersunk, then 16 are tapped. All outside faces are finished. A trunnion jig is used, and the triple-link end is bored from both sides. Saving on this job was 27.9%




SIZE: 24¾" wide, 24¼" high, 23¾" deep
⅜"-16 NC3 tap, 4 holes
3 5/16" bore, 4 holes and face
Bore 2.6250"-2.6262" & face, 6 holes
¼"-20 NC3 tap
½"-13 NC3 tap 8 holes
No. 10-24 NC3 tap, 3 holes
⅝"-11 NC3 tap, 4 holes
15/16" drill and spot face
⅝"-11 NC3 tap, 6 holes

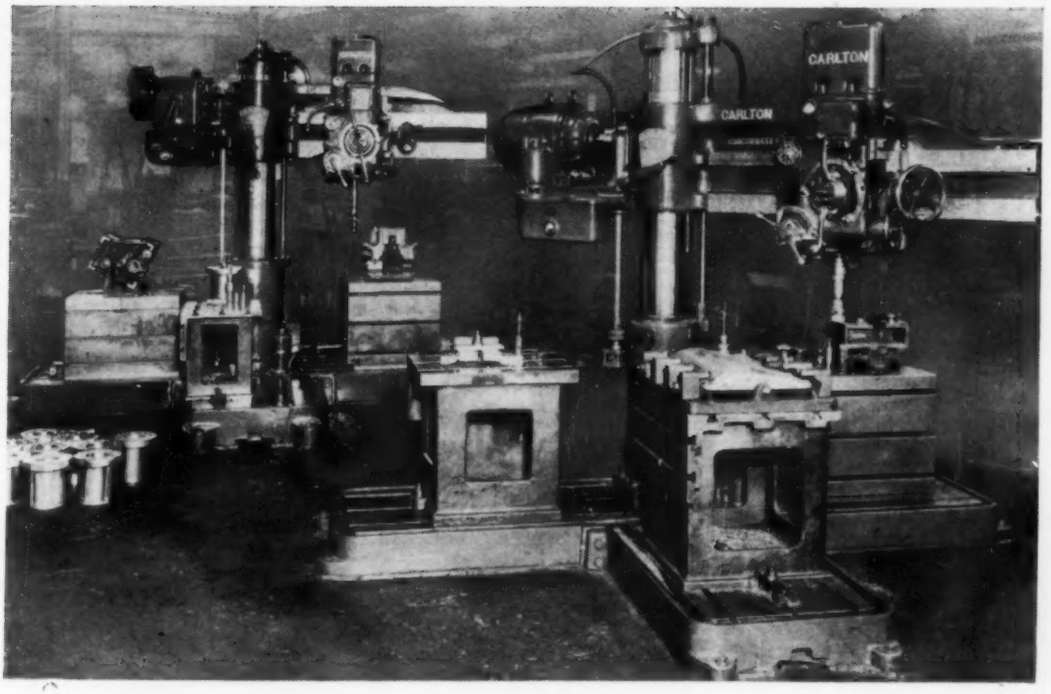
SAVING 11% In this box trunnion jig, tie-bar and linkpin holes are drilled and bored in the link cylinder plate, and the bosses around the tie-bar holes and those on the outside of the linkpin holes are faced. Then all small holes are drilled and tapped. Saving on this piece works out at 11%

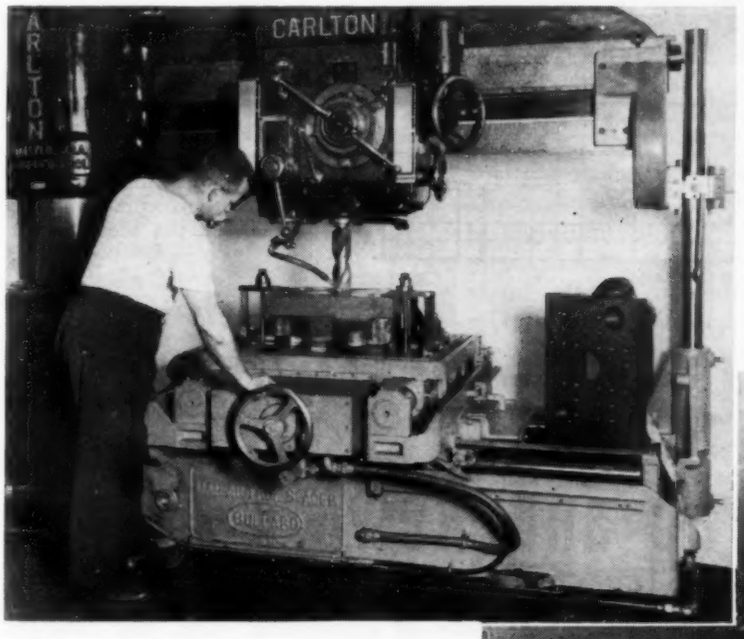

Bore 1.625"-1.626" 2 holes
Bore 1 17/32" and spotface 2 3/4"
Locating surfaces
⅝"-16 NC3 tap
1" drill and csk, 2 holes
½"-13 NC3 tap, 4 holes
Bore 2" 4 holes and spotface 2¼"

SAVING 22% End slides locate the crosshead in a trunnion jig. Inside bosses have also been milled previously. Linkpin and piston-rod holes are drilled and bored on the radial, outer bosses faced, and all other holes drilled and tapped. Saving is 21.9%

BOX-JIG JOBS

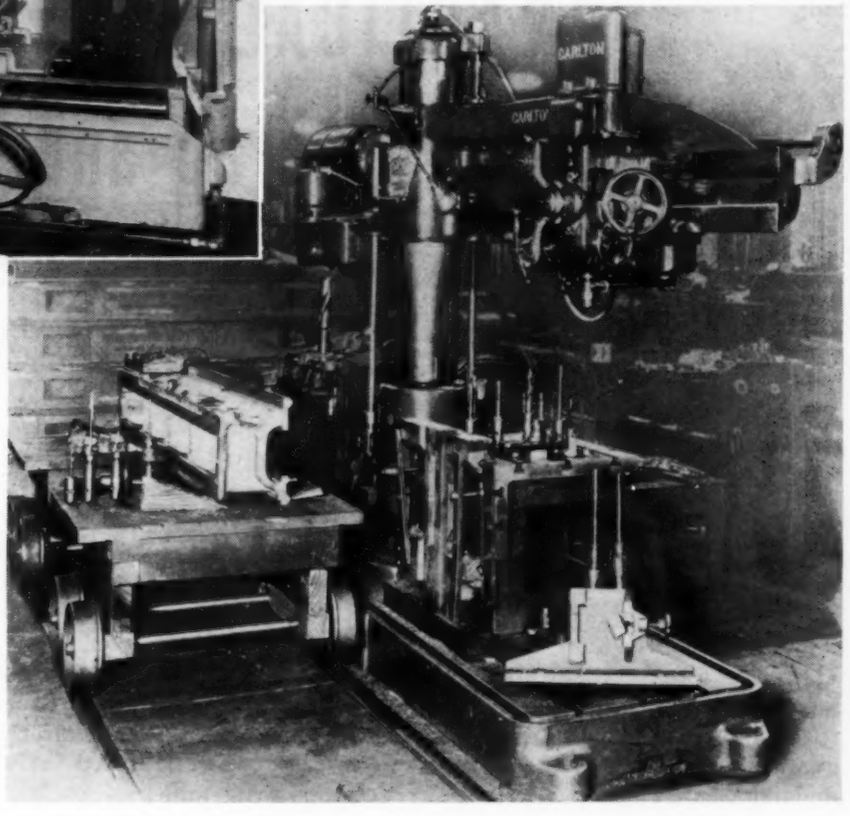
Small parts are handled in box jigs. Here, for example, are (left to right) the feed box, heater body, steady-rest base, lathe head cover and another feed box set up on two 4-ft. radials





SMALL LOTS

For high-accuracy jobs on new machine parts or other small-lot orders, a 6-ft. Carlton radial has been equipped with a 30-in. Bullard Man-Au-Trol spacer. Here a die plate for the 5A plastic injection molder is being drilled. By releasing the guide on the pilot bar at right, the drill can be switched to other jobs if needed. Meanwhile, it drills and bores a 5-in. center hole and two 4-in. tie-bar holes, and drills and taps 24 small holes in a modified die plate



TRUCKS HANDLE LONG PIECES

Side drilling of lathe beds or other work of any length is done by mounting the bed on two 4-wheel trucks running on tracks flush with the floor beside the radial. A drill plate can be clamped at the area to be drilled and tapped. The opposed tables on this 5-ft. radial are also set up to handle the lathe carriage

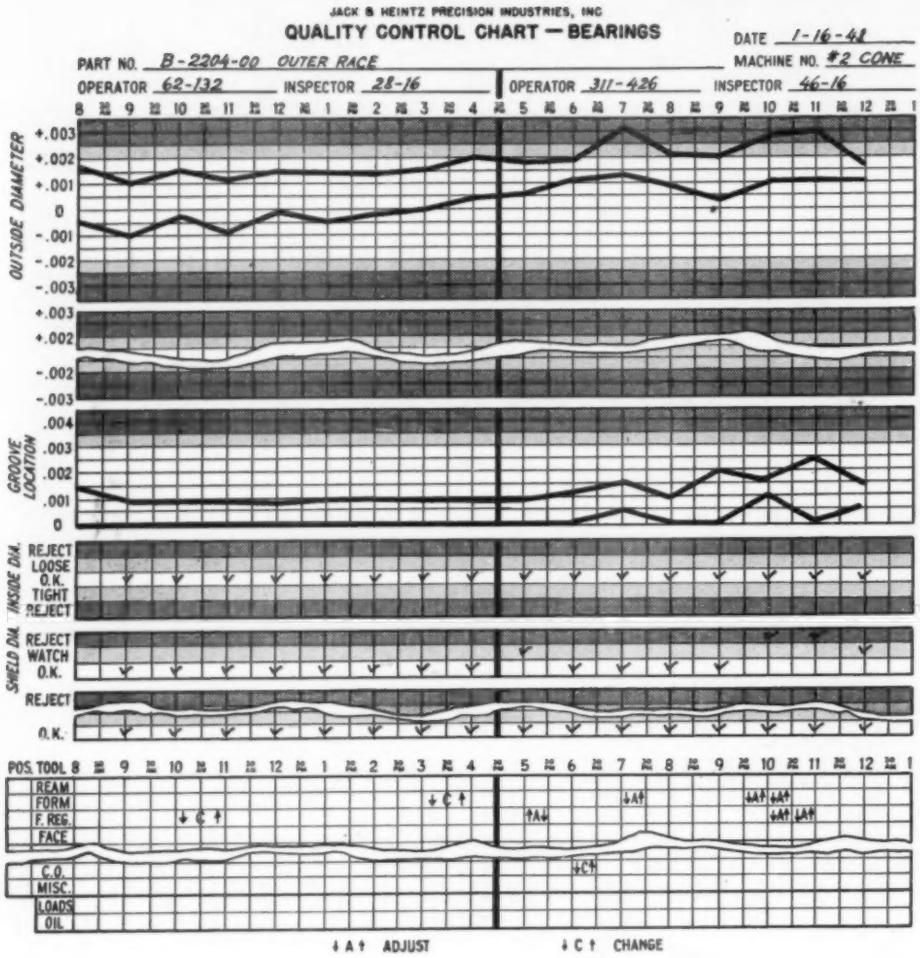


Fig. 1—*Partial chart* shows all the different methods included on a full chart for recording the results of inspections made hourly at each machine. Measured dimensions are entered on bands showing the extreme variation about the nominal. Go, no-go results are checked in the appropriate box. Tool changes and adjustments are noted at the bottom at the time of occurrence opposite the corresponding tool, thus giving a complete operating record. On an actual chart, there are four other bands, two similar to the top and two to the bottom strips, bands are subdivided into 0.0001 in. and are colored gray, blue and red. Blue areas (light tint) are danger zones, reds (dark tint) require a machine shutdown. Successive charted points are connected to indicate the trend and warn of impending trouble. An example of how the charts reveal the difference in machine operators can be seen in the top band. The first-shift man made fewer adjustments and turned in a better performance than the man on the second shift

PRACTICAL INSPECTION Lowers Scrap and Rework

This system insures maximum quality protection at economical cost, yet requires no involved calculations. Yearly savings in inspection personnel run to $50,000

BY JACK SHAFER
Superintendent, Inspection Department
JACK & HEINTZ PRECISION
INDUSTRIES, INC.

DEFECTS have been cut as much as 85% on operations in the Ball Bearing Division of Jack & Heintz Precision Industries. At the same time, inspection personnel has been reduced. These results have been brought about by inspection based upon simplified quality-control techniques easily understood by shop personnel. Practical and workable, the system carries most of the advantages of purely statistical methods and none of their complexities.

In the ball bearing division, the plan has been applied to the entire process from the receipt of raw material to the final packaging of bearings. Evidence of the tangible savings that have been produced can be seen in the reduction of scrap and rework listed in the accompanying table.

Percentage Defective Material

OPERATION	BEFORE	AFTER
O.D. Grind	1.1	0.14
I.D. Grind	1.9	0.30
Polish	22.8	4.9
Assembly	8.6	3.0

Comparison figures for defective work before and after installation of the quality-control system show the improvement that has resulted

There are also intangible savings that can never be truly measured. These include greater responsibility of operators for quality, less bottlenecking of material between operations, greater management control over defective operations, and more accurate evaluation of the ability of men, machines, and methods.

The system includes two main features. One is "process control" during production by means of charts. Quality is dependent upon production personnel. It is only through their efforts, using the chart method, that defective work can be avoided. The second aspect is "acceptance control." Material is approved, under a controlled sampling plan, for further processing after each operation. Both features are essential for over-all protection at low cost.

Process Control Charts

The chart system of process control is based on predetermined risk rates for both inspector mistakes and machine error. An inspector, in passing upon material, is open to two errors; acceptance of something he should have rejected, and vice versa. The result in either case is added production cost. These risks are allowed for in the charts at a predetermined minimum rate.

The allowance for machine-error risk is such that the chances of stopping a good machine and calling for corrective action when no action is necessary are 2½ in 100.

The quality-control charts, one of which is located at each machine, are designed to cover two shifts: 8:00 A.M. to 4:30 P.M., and 4:30 P.M. to 12:00 A.M. Each dimension that must be held within certain tolerance limits is given a charting band on which values may be entered. The gray area represents the desirable dimensional limits, or plus and/or minus tolerance. The blue band is a warning zone and the red band denotes a mandatory machine shutdown.

Dimensions that are measured on a "go" or "no-go" basis are given separate bands on which the inspector may designate O.K., watch, or reject. The white blocked area at the bottom of the chart is for recording corrections that have been made to machine setup and tooling.

Inspecting and Charting

Every hour a line inspector draws a sample of work produced at each of his machines during his absence. For automatic screw machines he takes one from each spindle; for grinding operations, he draws a random sample of five pieces. These samples are then completely inspected and the results are recorded at the correct time interval on the chart. On the measured dimensions he posts graphically the size of the largest and smallest piece. Those dimensions which are measured on a "go" or "no-go" basis are checked in the appropriate color area designating OK, watch, or reject.

For each charted dimension the inspector connects the point representing the largest piece to the similar point recorded for the previous lot. He does the same with the points for the smallest piece. The progressive vertical movement of these lines approaching the blue or red areas indicates the operating trend of the machine and gives warning to operators and inspectors of impending trouble.

The responsibility for the upkeep of the charts does not rest solely with the inspector. When the inspection trend indicates that corrective action is necessary, the operator makes the necessary adjustments or changes in tools, arranges for setup changes where called for, and records the action taken on the chart. This shows that corrective action has been taken to remedy failing quality. It also indicates to the production supervisor whether the changes and adjustments that the operator made were necessary from a quality standpoint.

Tracking Down Trouble

The greatest advantage of these charts is that a decline in the quality of any part can be tracked down before an appreciable number of pieces has been produced.

A production foreman may actually track down trouble something like this: As he walks through the machine floor and notes a poor chart he may turn to the operator and say, "You aren't doing so well today."

"I have another machine running and the chart is very good. It must be the setup man," the operator may answer.

When the setup man is called, he may remark, "Yes, I know that this machine shows a bad chart, but I set up these other two machines and the charts are very good. Maybe it's the tooling."

By such successive elimination

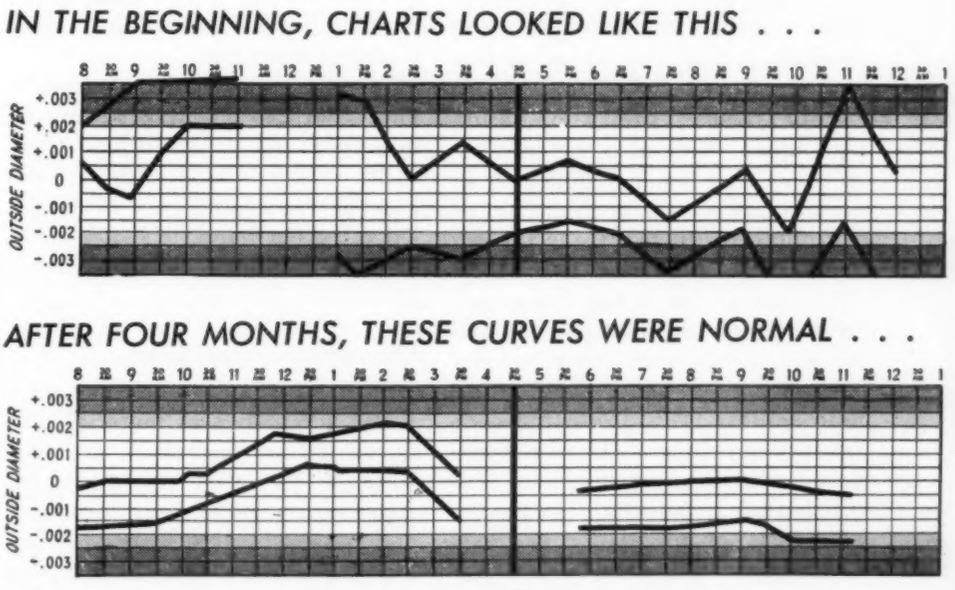

IN THE BEGINNING, CHARTS LOOKED LIKE THIS . . .
8 AM 9 AM 10 AM 11 AM 12 AM 1 PM 2 PM 3 PM 4 PM 5 PM 6 PM 7 PM 8 PM 9 PM 10 PM 11 PM 12 PM 1
OUTSIDE DIAMETER
+.003
+.002
+.001
0
-.001
-.002
-.003
AFTER FOUR MONTHS, THESE CURVES WERE NORMAL . . .
8 AM 9 AM 10 AM 11 AM 12 AM 1 PM 2 PM 3 PM 4 PM 5 PM 6 PM 7 PM 8 PM 9 PM 10 PM 11 PM 12 PM 1
OUTSIDE DIAMETER
+.003
+.002
+.001
0
-.001
-.002
-.003

Fig. 2—*Curve comparison* reveals the increase in operator effectiveness after installation of the system. The lower chart is for the same machine run by the same operator on the same part

SAMPLE	SAMPLE SIZE	COMBINED SAMPLES		
		SIZE	ACCEPTANCE NO.	REJECTION NO.
FIRST	35	35	0	2
SECOND	70	105	1	2

Fig. 3—*Sampling plan* requires a first sample of 35 pieces; no defects permits acceptance of the lot; two rejects calls for 100% inspection; one bad piece means drawing a second sample of 70 pieces. One defect in the combined samples allows acceptance of the lot, two requires 100% inspection

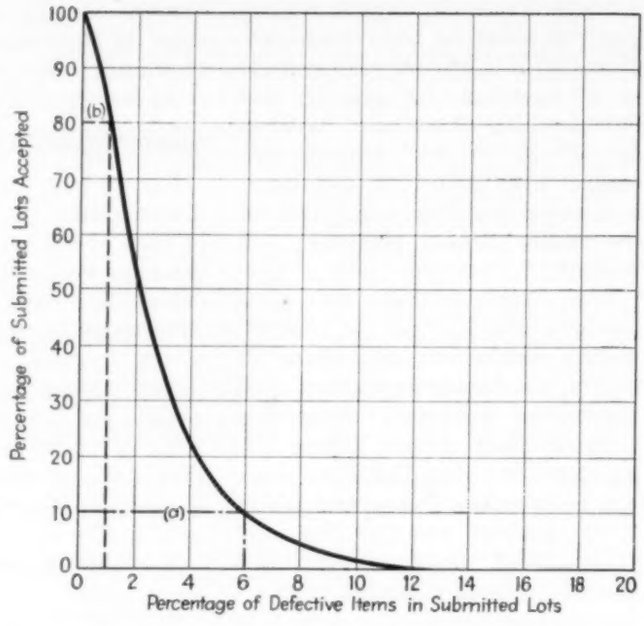


Fig. 4—*Operating characteristic* of the sampling plan shows the percentage of lots that will be accepted for any percentage of defects within the lot

the real cause of trouble can be brought to light. In addition to the operator or the setup being at fault, other causes may be: poor materials, improper lubricants or coolants, error in inspection equipment, or sloppy line inspection techniques. Still another cause may be methods, indicating that a new type of setup may be needed.

Quality Improves

How the charts have effected improvements in quality is best shown by example. The upper half of Fig. 2 is an actual control chart of operations on an automatic screw machine at the outset of the program. Note the inconsistency of the inspection results, which merely reflects spotty operating techniques. Note also the number of times that the machine had to be shut down because minimum or maximum readings were in the red band.

The lower half of Fig. 2 is a control chart of the operations of this *same machine* with the *same operators* on the *same part* almost four months later. Note the consistency of results obtained as compared with the earlier chart. This consistency is the result of concerted efforts of production foremen to track down causes, and of operators, setup men, and maintenance men to improve their operating efficiency. The improvement in quality resulting from a tighter holding to tolerances, not to mention the reduction in scrap, is at once apparent.

At the end of each day, the general production foreman examines all charts. Machines with a consistently poor record, regardless of operator, are candidates for an overhaul appraisal by the plant engineering department. Comparison of operators both on the same machine and on similar machines gives factual proof of consistently poor or good results. This forms the basis for censure or commendation of these individuals, or for possible replacement by more qualified operators.

In fact, probably the greatest impact of the charting system on quality is its psychological effect upon all personnel. It ferrets out poor operators and poor machines. On the other hand, it shows nothing but praise for good operators and good machines.

Operation Acceptance

The second phase of the system is the acceptance of material produced at an operation as being suitable for further processing. After parts have been produced and passed by line inspectors under the chart control system, the material is sampled by bench inspectors to verify the acceptability of processed material before the next operation can be performed.

Pieces are brought to the bench inspectors in segments of hourly production. These segments can be released to the bench from the machine only upon approval of the line inspector responsible for running the control chart. If the line inspector finds a piece with any dimension in the red band, the batch represented by this sample is automatically tagged to receive 100% bench inspection. In this manner, any trouble revealed by the control chart is screened out of production before more processing is performed.

Segments of production that are okay on the chart are presented to the bench inspector for sampling. After each operation, O.D. grind, I.D. grind, groove grind, polish, and assembly, the parts are sampled and the quality ascertained.

These sampling plans are set up on a controlled basis wherein the risk of accepting bad work is known and recognized. Cost is the premise upon which the plans are established. It is cheaper to allow a few defective pieces to slip into the production process and to perform work on pieces that will eventually be scrapped than to perform 100% inspection after each operation. On the other hand, on batches of low quality, it is cheaper to perform 100% inspection to screen out the defects.

Defects Are Classified

The first requirement in established sound acceptance procedure is the classifying of defects into categories of importance.

Major defects are those that will cause a complaint from the field of failure to function in accordance with design, and those on which the defective dimension receives only one inspection during processing.

Minor defects fall into two groups:

1. Those that are major but which, (a) may be corrected during a subsequent operation (such as polishing), or (b), will receive a subsequent inspection on the defective dimension.
2. Deviations from good workmanship that have no effect upon the functioning of the part.

All possible defects are broken down into these classifications, and the bench inspector keeps them in mind as he examines the sample of the hourly production. The sampling plan is designed to hold a high quality on major defects, but is more lenient on those that are minor. If the sample reveals more than a stated number of bad pieces, the batch is rejected and is given a 100% inspection.

How Sampling Works

A typical sampling scheme is as follows (Fig. 3): from each segment of production, draw a sample of 35 pieces and inspect for major defectives.

1. If no defects are found, accept the lot for further processing.
2. If two (2) major defectives are found, inspect the material 100%.
3. If one (1) major defect is found, draw seventy (70) more pieces from the lot.
   (a) If out of the total of 105 parts, only one (1) major defective has been found, accept the lot.
   (b) If two (2) or more defectives have been found, reject the material and perform 100% inspection.

The plan described has a guaranteed quality limit of 1% defective. This means that on the average the most bad work the plan will pass is 1%. This is for between-operation inspection. The final acceptance for the ultimate consumer is much more rigid.

Quality Hurdles

These sampling plans are like quality hurdles that the material must clear before passing to the next operation. Through them a guaranteed average quality can be maintained and assured to the following operation.

The final hurdle that material must clear is just prior to packaging where samples are drawn and inspected to ascertain the quality of product going to the final customer. Here, the inspection system is set for extremely high quality. For major defects, 0.1% defective is the goal of acceptability.

Acceptance schemes guarantee predetermined quality between operation and permit refining quality until components pass the severe sampling plan that determines final acceptance of the complete bearing. This concept of refining quality as operations progress is likened to a distillation process, where impurities are rejected until the final material reaches its highest degree of purity.

The graph, Fig. 4, shows the "operating characteristics" of the sampling plan described and is interpreted as follows: the sampling scheme is so designed that if the lots submitted to the bench inspector average 6% defective items, only 10% of the lots will be accepted (a - line); the balance will receive 100% inspection. On the other hand, should material contain only 1% defective items, 80% of the lots will be accepted and only 20% need be inspected 100% (b - line).

Protection Is Assured

This is the statistical approach to the chance the inspector runs of accepting poor quality material or rejecting good work. For each operation acceptance, the operating characteristics are established and built to the desired quality level. Just as surely as insurance companies set their premium rates to guarantee a profit based on the laws of chance, so will these designed acceptance plans work to guarantee a quality at an economical level. After all, what is inspection but insurance? The only protection received is what is paid for, but just as there is the possibility of being over-insured or under-insured, a product can be over-inspected or under-inspected. Without this schematic inspection system, we could not be sure of getting maximum quality protection at the most economical level of cost.

ACID MACHINING

INTERESTING and unusual among metalworking processes is the cutting of thin-gage metals by acid etching, the process roughly following that of "engraving" a printing plate. Commonest of metals thus cut is copper; commonest products are instrument reticles and ultra-detailed cut-through elements. A typical reticle is a series of concentric rings cut through ½-in. dia., 0.002-in. copper, each ring about 0.001 in. wide, with webs of only a few tenths holding parts together and a central hole about 0.0005 in. in diameter. A "trick" product is a miniature (2-in-wide) of a full-rigged ship in silhouette, with rigging in full detail. Extremely fine elements in thin materials can be thus produced.

Such pieces are made by registering a pair of duplicate photographic negatives and taping them on three sides to form an envelope. The copper sheet, with both sides sensitized by a photographic emulsion, is slipped into this envelope and exposed to light, then developed and fixed. Areas exposed to light will remain coated, while unexposed areas are clear. The piece is then etched from both sides.

This is, in effect, "doubling up" the process of engraving line cuts and involves the same techniques.

Acid etching has also been used to cut very thin and involved surface designs in plastic molds.

HOW TO TREAT A GAGE

For continued accuracy, gages must be carefully treated. Here the head of the largest gage laboratory in the East passes on the suggestions he makes to students

BY PROF. W. A. MAC CREHAN, JR.

Director of the Gage Laboratory
College of Engineering, New York University

PROPER HANDLING is of utmost importance in preservation of the original accuracy incorporated in a gage. Burrs and nicks created by rough handling will give imperfect readings and score the surface of the inspected part. Shock, such as that created by dropping a gage, can destroy the calibrated accuracy; all gages "shocked" should be re-checked for calibration before use. Variance in temperature between the part to be checked and the gage will give false readings; both parts should be held for checking at maximum accuracy at 68 F. This is particularly true of aluminum and magnesium, which have very high coefficients of expansion.

Dirt Is the Enemy

Dirt is the greatest enemy of gage accuracy. The tiny particles create a heavy abrasive action between the surfaces of the gage and the part to be gaged. Before an inspection, the part should be thoroughly cleared of chips, metal dust, and cutting oils. In shop practice, an air hose, kerosene rinse, and cleaning cloths are a necessity for inspection of milled, turned or ground parts. The gage itself should be carefully wiped off each time an inspection is made to insure gaging surfaces absolutely free of chips and dirt. This is handled in the shop with cleaning cloths or soft absorbent-paper toweling and in the laboratory with carbon tetrachloride and a chamois, or alcohol and a lint-free silk cloth.

It should be a carefully planned routine that each gage have a definite storage place, preferably covered, and that the gage be stored in this assigned spot. The storage place must be free from dust, chips, and soluble cutting oils. For brief periods of storage, careful wiping of calibrated surfaces will suffice for shop-use gages; however, if the gage is to stand idle for longer than 24 hr., cover gaging surfaces with a light coat of white petrolatum (free from acid) or a mixture of anhydrous lanolin and white petrolatum. It must be thoroughly understood that clean cloths must be used, a clean chamois, or clean tissues, for removing the light film of protective coating. For long storage, commercial protective coatings should be employed.

The ability of a gage to maintain its accuracy can be enhanced if caution is employed to prevent the surface of one gage from coming in contact with the surface of another, as the hardened surfaces on one will quickly create a nick or a burr.

Specialized hardened wear anvils (carbide, sapphire, Norbide, diamond, etc.) are quite brittle, and care should be taken that the workpiece engages with the wear anvil in a gentle manner, not by direct shock.

Protect in Storage

Shop tools that have mating parts, such as vernier caliper, depth vernier, height vernier, vernier protractor, angle gages, etc., should have protective coatings before being placed in their containers, for a chemical action occurs between the sliding parts and they will rust very easily unless protected.

Moisture in a shop tool crib or tool cabinet is a serious hazard to maintenance of gages. Silica gel is generally employed to "dry" the air by removing the moisture. If such a condition is prevalent, the light protective coating after use is a must to insure freedom from rust.

Factors that create a change in the calibrated accuracy of a gage can be summarized as:

Handling: A gage should be set squarely up to the part being checked and gently slid into the part. If resistance is met, it must not be forced, but the part should be rechecked for freedom from dirt and cutting oils, nicks and burrs, and the gage carefully wiped. Movement of the gage, when it is a cylindrical, ball or plug gage, should always be directly in line with the part being gaged. Never should the gage or the part be spiralled or twisted in gaging.

Maintenance of Gaging Surface: Protect with a suitable coating and clean thoroughly before using.

Shock: Recalibrate before using.

Wear: Dirt, cutting oils, chips, burrs, all cause wear if they contact gaging surfaces.

Maintaining Gage Accuracy

Periodic inspection of shop gages by qualified personnel in a restricted room held at a constant 68 F. is the ideal for inspection and calibration of gages.

How often to check a gage is based entirely on the use, the area, and the ability of the personnel correctly to employ the gage. As a generalization, a fixed tool, such as a plug gage under normal usage, should be checked every second week, whereas a tool used to reproduce varied dimensions, such as micrometer, should be rechecked

every time it is withdrawn from service, and recalibrated by tool inspection once a week.

It is standard shop practice to have available, in convenient locations, a set of standards from which operators may recheck their measurement tools before usage. The tool inspection room should keep a complete history of each gage from its purchase date to obsolescence or retirement. This serves as an indicator as to conditions that might be expected from areas, types of work, inspection personnel, and structural designs, and provides a good source of information for data on future purchases, predictions of life of gages and ability to maintain purchased tolerances. Two such cards are illustrated.

Keep Maintenance Records

Upon the establishment of "conditions of use," a method should be introduced by which some means can be set up showing the maintenance record of a gage. Many companies employ color coding, which shows by having a set color for each day, week, and month, the last time the gage was calibrated. By following the visual method, many other shop supervisors, such as foremen, engineers, etc., can aid in the program of proper gage maintenance by having a handy chart to compare the tiny drops of color-code paint placed on the gage with the current date, and quickly estimate the time lapse between rechecks at tool inspection. Other firms use a series of numbers in a similar manner. The foreman of each department should bear partial responsibility to see that his employees observe the requirements of gage mainteance. In some shops, this check is tied in with first-piece inspection slips as punched by the area inspector.

Tool Inspection Room

The maintenance and care of the tool inspection room is a prime consideration in instituting a program of correct gaging calibrations. It should be the model for the shop to look up to and respect in the field of accuracy. The complete faith of men, using gages day after day that are calibrated by tool inspectors who are completely qualified, is of utmost importance in employee morale.

Air conditioning as a means of holding the desired 68 F. temperature is excellent, as the moisture content can also be controlled, preventing dampness and rust at the same time.

Cleanliness is a number one consideration. Each part before gaging must be scrupulously wiped free of dirt, chips, or cutting oils with clean cloths or tissues before taking a measurement. Each gage used must be checked against a master calibration such as "Jo" blocks or supermicrometer, and the master-calibration units in turn must have a periodic check in line

TWO TYPICAL GAGE MAINTENANCE RECORDS . . .

GAGE MAINTENANCE RECORD — SHOP SERIAL NO. 7293

		CHECK FREQUENCY		CHECKED	O.K.	REPAIR	OBS
NAME	0-1 Micrometer	1					
TYPE	Vernier barrel 1/10,000	3		6/1/48	✓		EWT
MAKER	L. S. Starrett	7	✓	6/8/48	✓		JWE
PRICE	$16.50	14		6/15/48		✓	JWE
PURCHASE REQUISITION	4B 871 5/23/48	1 mo.		6/22/48		✓	JWE
UTILIZATION	General shop use	6 mos.		6/27/48		✓	EWT
CONTACT MAN	S. Johnson Planning Dep't.			REVIEW			W.A.M.
REMARKS: Mic dropped 6/15/48, recalibrated.				6/28/48	To factory		EWT W.A.M.
Mic out .002 on 6/22/48				7/19/48	✓		JWE
Mic out .0015 on 6/27/48				7/26/48	✓		JWE
Rechecks on return from factory show				8/2/48	✓		JWE
mic holding adjustment.				8/10/48	✓		JWE

5-Day Card . . This rotary-file record card (3x5 in.) shows type of tool and all details, including date of purchase and cost. Here it is clear that a standard 0-1 micrometer was purchased May 23 on requisition 4B871, ordered by S. Johnson of Planning for general shop use. The check frequency is every seven days. Damage occurred after two checks and repeat checks indicated need for overhaul. In review, the crib superintendent ordered overhaul, after which it was O.K. again

GAGE MAINTENANCE RECORD — SHOP SERIAL NO. 8164

		CHECK FREQUENCY		CHECKED	O.K.	REPAIR	OBS
NAME	Strain gage, electronic	1	✓	10/1/48	✓		RWS
TYPE	Bench comparator .00005	3		10/2/48	✓		EWT
MAKER	Brown & Sharpe	7		10/3/48	✓		EWT
PRICE	$1064.00	14		10/6/48	✓		EWT
PURCHASE REQUISITION	4G 268	1 mo.		10/7/48	✓		RWS
UTILIZATION	Grinding of rotor shaft	6 mos.		10/8/48	✓		EWT
CONTACT MAN	Henry King Planning Dep't.			REVIEW			W.A.M.
REMARKS: Machine meeting Johansson				10/9/48	✓		JWE
test at review.				10/10/48	✓		RWS
Tube blown 10/14/48 — repaired.				10/13/48	✓		EWT
Recheck on 10/15/48 showed calibration				10/14/48		✓	EWT
within allowance.				10/15/48	✓		JWE

6-Day Card . . Similar to the other card, this one is set up for a 6-day working week. Here the check frequency is daily. Such cards are not destroyed when full, but kept in the file ahead of newer cards carrying serial number only. When a new card is issued, review by the crib supervisor is automatic. These cards were designed for a specific high-production job, so such items as inventory and restock date are not included. Such decisions are usually the responsibility of the gage foreman, as he handles review of gages, he in turn can handle maximum and minimum ordering

according to the degree of usage.

In the average shop, it is common practice to use a grade "B" precision measurement reference set out in the shop where it is exposed to wear and other hazards and keep the grade "A" or "AA" reference sets in the tool inspection room.

The better-equipped shops have their own checking gage blocks, such as optical flats utilizing monochromatic light and electrically amplified comparators; however, for the small shops, the gage-block manufacturers charge only a nominal sum to recheck used reference blocks.

To maintain strict control over initial tooling setups in the shop, a competent jig, fixture, and shop gaging station should be set up. This specialized inspection area should be capably manned and be provided with adequate basic tools to cover solution of measurement problems. Typical instruments would include: set of reference blocks—grade A, height vernier, scriber, dial indicators 0.001 and 0.0001, depth vernier, sine bar, vernier protractor, and 12-in. scale (1/64-in. graduation). The area should have a good surface plate adequate to cover expected problems various-size parallel bars and clamps, a set of micrometers from 0.0000 to 6.000 in., and a set of verniers in keeping with the size of manufactured parts to be checked. Many specialized tools, such as telescopic pins, ball gages, bench centers, etc., will prove invaluable for unusual setups.

As in the case of all gages, inspection plate work must be built around accuracy, which as a first step is clean parts, clean gages, clean reference points.

Care and Maintenance Of Thread Gages

Thread inspection is a specialized technique. It is all-important to insure that threads on the part are clean, burr-free and at room temperature. A good magnifying glass and a cool tinted light are helpful in detection of foreign matter in threads. Many shops use a toothbrush and clear kerosene to scrub threads, then air blast to dry. It must be remembered that there is heavy frictional pressure on the mating surfaces of the gage and the threads of the part to be gaged. Thus any foreign particles will jam between the surfaces, causing binding and occasional scoring of the gage.

After use, general practice is to cover gage threads and thread wires with white petrolatum (acid free).

The angle in the thread micrometer must be checked periodically, over and above periodic "lead" calibration for angular conformance.

The roll thread snap gage must be oiled at the bearing in the center of the thread roll periodically, and it should be set up for rechecking in a manner similar to that required for any snap gage, with the exception that the master will of course be a male reference thread roll gage plug.

Specialized Instruments

Very specialized instruments, such as supermicrometers, optical projectors, etc., should be maintained according to the manufacturer's instructions, but a common shop rule is not to leave the reference block, or other close-tolerance parts, in contact with anvils or surface plates over any extended periods because of possible chemical action. A light protective coating of white petrolatum (acid free) is a safe protective coating for close-tolerance finished surfaces.

"I wonder if you could make it a simple 'yes' or 'no', so our department has something concrete to raise hell about."

Tips FOR TOP SHOP MEN

268 Insist upon good shopkeeping. Cleaning and straightening up cuts material and tool losses, accident hazards, even slovenly thinking. The accompanying once-over spots maintenance troubles before they become breakdowns.

269 What you don't specify can cost you more than what you *do*—if you fail to think about the specifications in the light of the man who must convert them into production. He may naturally assume closer tolerances or better finishes than you require—which will cost you money.

270 Are you a hoarder? Are your tool cribs crammed with tools and your stockrooms with parts and materials left over from old orders—insurance against potential trouble—that costs more than the trouble could? Remember that a plant can have an "attic" full of antiques even when there's no attic—and that it fills faster than a home one.

ROUND TABLE

Men Only?

"Al, I hear the big boss's considering putting on a couple of women in my department," said Ed. "I can't see, for the life of me, what the big idea is, can you?"

"Yes, I can, Ed. Remember the shortage of skilled help we had during the war?"

"There's no war going on now, is there?"

"No, Ed, not a shooting war, but a cold one that may eventuate in shooting sooner than we think. The Big Boss is not going to be caught napping this time."

"Ye gods, man!" snapped Ed. "Do you mean to sit there and say that I'm going to have a crew of skirts in my shop?"

"That's entirely possible," Al smiled. "Skirts or pants, it doesn't matter; the work has to proceed, and if we can't get men to do it we'll have to get women."

"But, Al, I just can't picture women in a toolroom—why the guys wouldn't be able to keep their minds on their work. Can you imagine yourself working to fine limits with a sweet-smelling, shapely babe next to you?"

"Now, don't go picking on my weaknesses, Ed; let's look at this thing objectively. Women have handled men's job successfully before and they can do it again—why, even Princess Elizabeth was an auto mechanic over in England during the last scrap!"

"Bah!" sneered Ed; "that's what the papers say."

"She's not the only woman who came through with flying colors during our life-and-death struggle—why, look at the record of our own women!"

"You look at it, my friend; I don't want to think of women toolmakers at all!"

"You're going to have to if war does come," warned Al. "We're going to need every man that can be spared."

"Do you actually mean to say that you have faith in women being able to do the work that the men are now doing in my department?"

"I certainly have! They're mentally equal, if not superior—oh, they may not have the oomph—but we can manage to overcome that when the time comes."

"We!" laughed Ed. "How do you know we'll be around? Maybe there'll be skirts on our jobs by that time!"

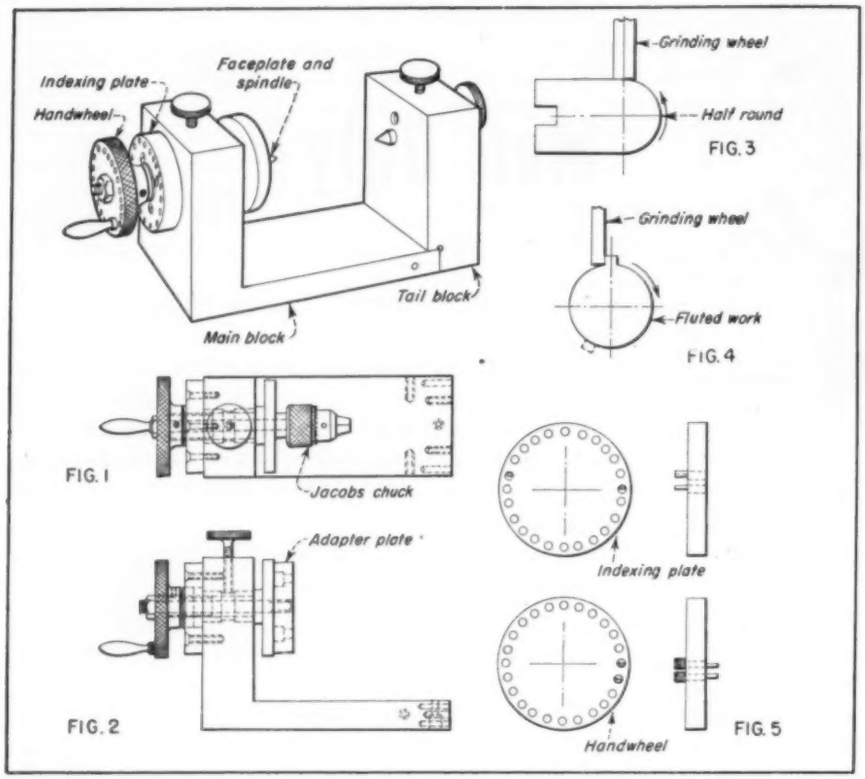
"I wouldn't be surprised if there were. We may not be so young, but we've got to prepare for a desperate struggle this time, and age won't count so much."

"Excuse me, Mr. Foreman," piped up Ed in a falsetto, "I have to go to the restroom to powder my nose."

"Laugh all you want to, Ed. I can see the handwriting on the wall; you had better see it pretty soon yourself."

***Have women a place** in Metalworking production? Can they stand the gaff? Does their output equal the disturbance they may create in a mixed crew? Your experiences and ideas will interest others. Discussions of earlier topics appear on later pages.*

Practical Ideas



Precision Centering Fixture Sets Up Cylindrical Grinds

WITHOUT a cylindrical grinder, many small shops must farm out work that they cannot handle on a surface grinder. This fixture solved that problem in our shop, and also allows us to do work that cannot normally be done even on a cylindrical machine.

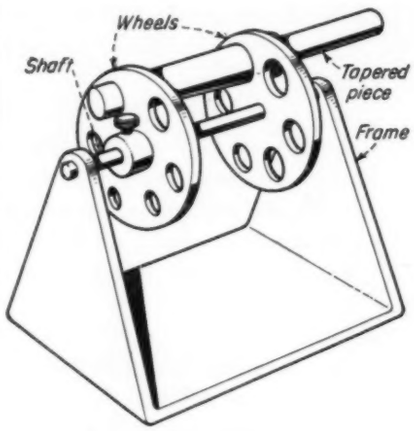
The main parts are a main block, spindle, a handwheel and an indexing plate. The handwheel and indexing plate make it possible to accurately grind partial cylinders and special jobs.

A tailblock is attachable with long bolts to the main block. This carries a hardened and ground center with two knurled-head screws that control the center-to-center distance of the fixture and lock the tail spindle in position, respectively.

In the head section, two mild-steel bushings support a hardened and ground spindle. Actually there are two spindles, one to support the adapter plate, when needed (Fig. 2), and one that carries a center and will also support a Jacobs chuck (Fig. 1).

For normal cylindrical work, the piece is set up between the centers, with the tailblock bolted in position, and the work is rotated by the handwheel. With the fixture placed on the magnetic table of a standard surface grinder, and aligned properly, common cylindrical grinds can be made. Taper grinding is handled by simply turning the fixture, in relation to the axis of the grinding wheel, the required amount for any taper.

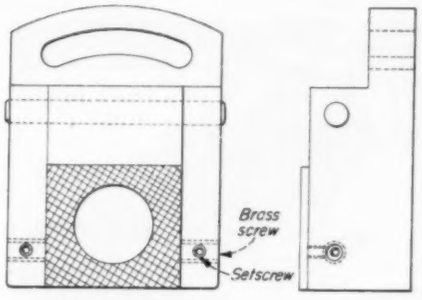
Special jobs, such as partial cylinders (Fig. 3 & 4), can be controlled through the use of pins placed in both the indexing plate and the handwheel. Each plate is drilled in 24 positions around its circumference. Short pins (Fig. 5) are set in the indexing plate, and longer pins, with knurled ends projecting from the lever side of the handwheel, are placed in the handwheel. Since these can be set in any position, in multiples of 15° around the circle, and since the handwheel can be rotated on the spindle and re-clamped by a set-screw, any length of arc can be ground. *Allan B. Nixon, Springfield, Mass.*



Wheel Fixture Gages Tapers

TAPERED SHAFTS that are in the process of being duplicated can be inserted in this fixture to provide a gage for the new piece. The two wheels, drilled in six places with various sizes of holes, are rotated individually to line up two that match the taper of the original part.

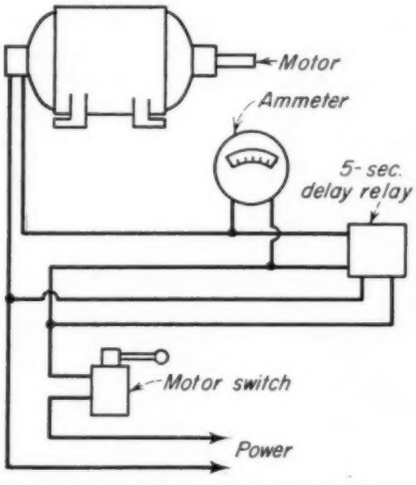
The old part is inserted and the wheels are adjusted on the shaft for an exact fit, moving one in or out. Then the partially complete taper on the new piece can be checked in the fixture. With standard-size holes and an accurate steel scale, tapers can be pre-set on the fixture and new pieces made with no model being necessary. *H. Moore, Leeds, England.*



Clapper-Box Side Play Halted by Brass Screws

SIDE PLAY between tool block and clapper box on a shaper can be eliminated if a brass, flat-end screw is fitted into both sides of the clapper box.

Two holes are drilled and tapped for the brass screws, and two other holes, somewhat smaller, are drilled and tapped in at right angles to these. A small brass shoe is held tight against each brass screw by a setcrew. This fixes the brass screws after they have been located to stop side play. *A. D. Rayment, Beloit, Wis.*

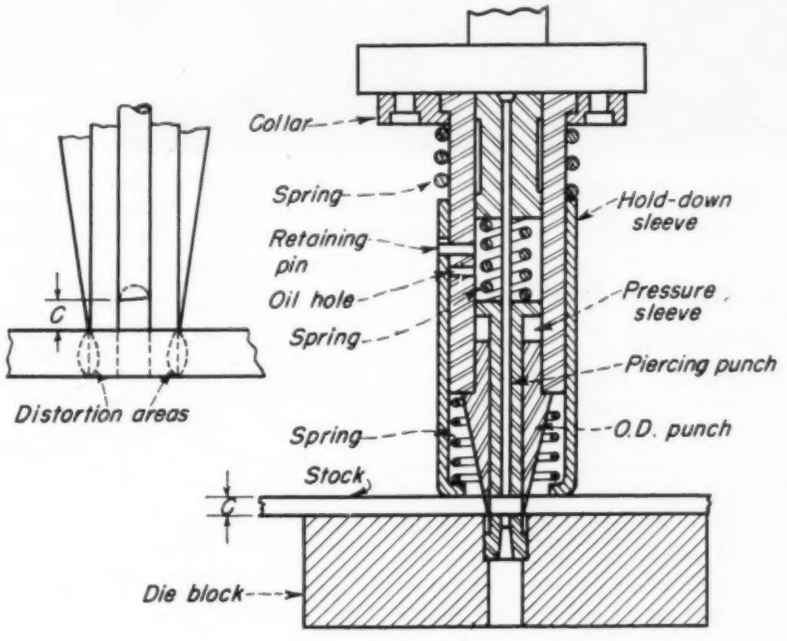


Ammeter Load Gage Indicates Condition of Tool

EFFICIENT OPERATION of machine tools depends upon loading them close to their safe capacity. While this may be gaged approximately by an experienced operator, accuracy can be built into the machine by installing an ammeter load gage. The same gage indicates readily when the tool requires dressing or sharpening by showing an unusually high load.

The diagram illustrates how the control switch, a time-delay relay (to protect the ammeter from high starting currents) and the ammeter are wired up. If the ammeter is a radio-frequency type, it will have a better gage spread in the high half of the dial. The ammeter should be chosen so as to indicate up to about one-quarter overload. Parts are available, generally, in surplus stock.

The dial should be marked at full motor load, and in quarters. The operator can easily set his depth of cut, regardless of load and type of material, by making trial runs and loading the machine until the ammeter reads around full load. Continuous operation should not be undertaken with more than 15% overload under any conditions. *Chandler A. Phillips, Millbrae, Cal.*



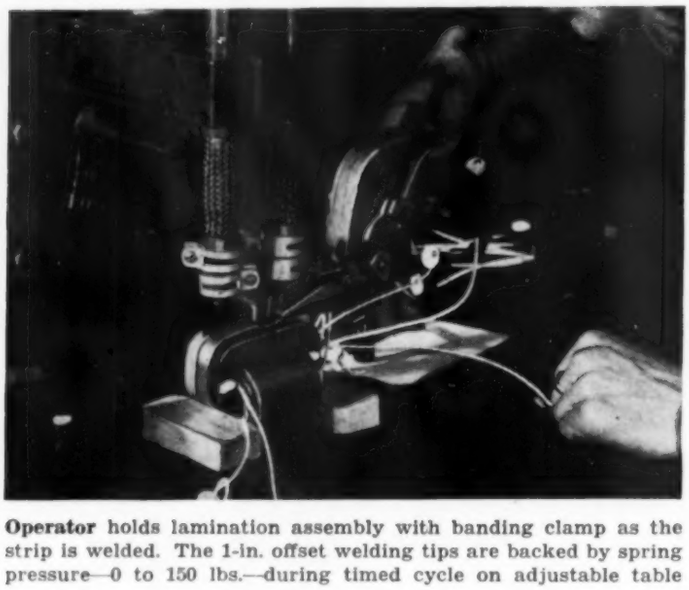
Double Punch Blanks and Pierces Straight-Sided Rubber Washers

RUBBER WASHERS are difficult to produce with any accuracy because the material is soft and yields in the die. This trouble can be greatly reduced by a punch and die similar to the illustrated model.

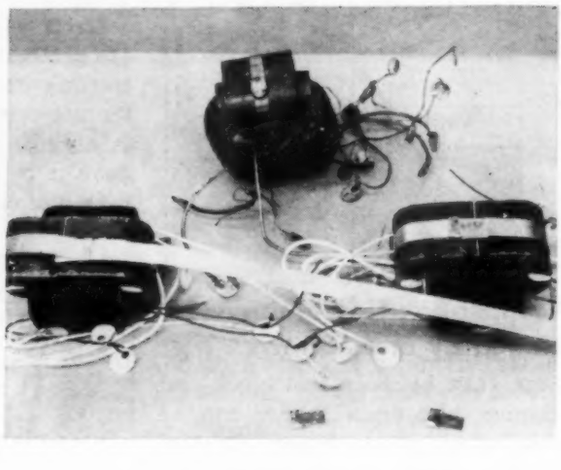
In the punch assembly a pressure sleeve is employed to hold down the stock between the punches, and a second hold-down sleeve controls the rubber outside the outer punch. The washer O.D. produced can be changed, even though the same punches are employed, by varying the pressure under the inner sleeve. When no pressure is applied, the outside diameter is cut along the outside of the area of distortion, but when pressure is applied, this cut moves in toward the inside of the area.

The punch is composed of a set of inner and outer punches, cutting the center hole and the O.D. Two sleeves are spring-loaded and are adjustable through their springs. The outer sleeve is held in place by a pin working in a slot in its side. All sliding surfaces are mated with slip fits except the O.D. punch which is pressed onto the hollow shank that is held to the punch holder by a collar.

The punch and die have produced relatively straight-sided washers, although soft material thicker than about 0.04 in. is difficult to control by any means. In this setup the blanking punch cuts through first, which limits the distortion of the rubber. *Joseph Budnick, Bellerose, N. Y.*



Operator holds lamination assembly with banding clamp as the strip is welded. The 1-in. offset welding tips are backed by spring pressure—0 to 150 lbs.—during timed cycle on adjustable table

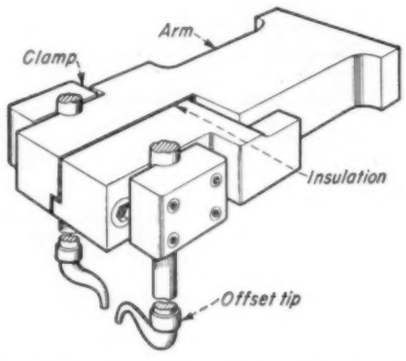


Old method, with soldered joint, is shown at top. New method, below, is to thread seal on strip, tighten strip with banding clamp, and spotweld the strip in the specially adapted spotwelder

New Welding Arm Spots Holding Strips

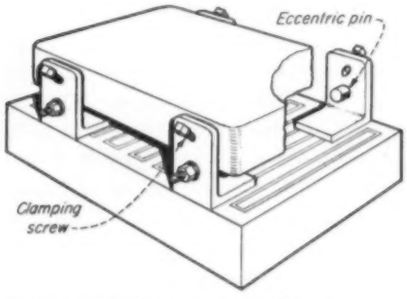
LAMINATIONS for small C-core transformers must be held together during baking, and for this purpose a metal strip is wrapped around them. The strip was formerly soldered in place, but under heat the solder would soften, the band would often loosen, and many cores were damaged by the melting solder.

Welded strips were made possible by revamping a 15-KVA Thompson-Gibb spotwelder. The old arms were replaced with a new split arm that clamped two offset electrodes. These spotwelded through the metal strip only, and provided a permanent fastening.



Offset tips to spotweld banding strips are clamped in double arm that replaces original upper arm. Insulating material separates the two electrodes

Small metal seals were employed for locating the strips. A strip bander tightened the strips and held them under the welding machine. Considerable saving was realized with this method. Aside from the virtual elimination of rejections, the work time was cut from 0.10 hour to 0.020 hour. *T. E. Tyler, Baltimore, Md.*



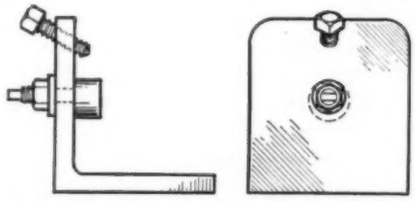
Eccentric Pins Level Work On Cylinder Grinder

NON-PARALLEL parts that must be ground on a surface grinder can be set up on fixtures that hold them above the table surface. These clamps that I made for holding cylinder heads are adjustable within a small range of height and can be employed for many near-parallel shapes.

The bases were made like angle plates, and were drilled and tapped for a holding setscrew and an eccentric locating pin. The setscrew hole was drilled at a slant in each clamp to provide some down pressure.

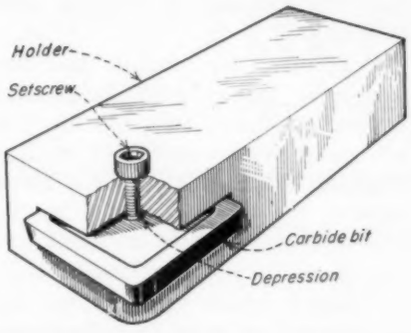
The eccentric pins were turned 1/16 in. off center, with a ¾-in. threaded shank and a square end for a wrench. A standard nut and washer were assembled with each pin. Slight height adjustments were made by loosening one nut, turning the pin one way or the other, and retightening.

Work is most easily set up if all four eccentric pins are first turned so they are centered. Then any pin can be turned either up or down for adjustment.



Setscrews at a slant clamp on flanges or exert holding pressure on sides of the workpiece

This particular job, cylinder heads, fitted easily on the clamps with the water outlet clearing the magnetic table. Magnetic power held the clamps down, and the setscrews held the work. *Harold W. Cutting, Lompoc, Cal.*



Carbide Bit Has Four Edges

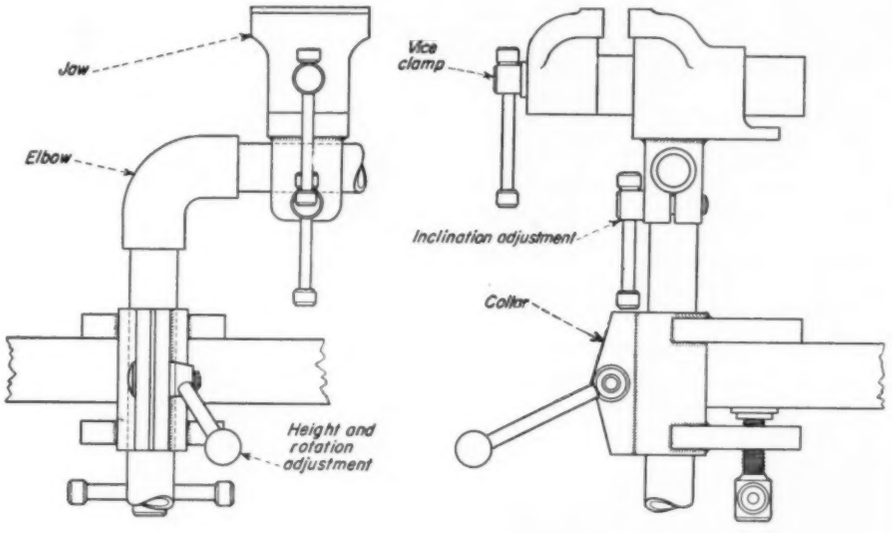
FOUR NEW EDGES can be positioned for turning and facing work with the carbide toolbit shown before resharpening is necessary. The bit is square, with the relief and rake angles ground all around. A depression is ground on the center of the top pin in which the end of the socket-head setscrew clamps to hold the bit firmly. The bit also rests against the back and side of the slotted-out tough-steel holder.

With the depression ground out much larger than the tip of the screw, the bit can be rotated without removing it from the holder, and the screw will also clamp after several regrinds have reduced the outside dimensions of the bit. *Walter Dimitruk, New York, N. Y.*

Lock-Washer Stop Really Stops

AFTER HAVING a lot of trouble with the lock-nut stops on a drillpress, I tried a number of methods of setting stops that would not move under the pounding they normally received when the drill was moved up and down.

A split lock washer was the answer, mounted between two knurled lock nuts. I ground off the corners of the washer to prevent it from digging into the nuts. The stops really hold now. *Dominick Pernini, Chicago, Ill.*



Midget Vise Clamps Small Die Work

INTRICATE PARTS requiring hand filing and polishing are finished on a number of vises patterned after the illustrated model. Its 360° movement allows clamping in any position.

A stock cast-steel vise was modified by sawing off its bolt-down lugs and a drilled split block was welded to the bottom. A locking screw holds it to the pipe support, which includes a right-angle elbow. The vertical pipe length is clamped to the bench in a sleeve that has two plates welded to it. A quick-acting clamp can be used to adjust the height and position.

The width of jaws is 2½ in. Because the vise can be moved around so readily, the user can stand or sit at work, and height can be adjusted for a tall or short operator. *Clifford T. Bower, Decatur, Ga.*

$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

66TH WINNER:

HARRY SMITH

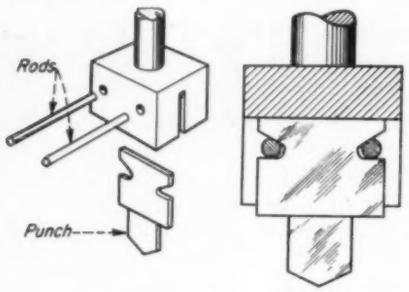
Pivoting Indicator

Workholding Stand Eases Brazing Operations

BRAZING is often a cumbersome operation, but can be simplified by the use of good holding fixtures. This stand is to position the work for brazing leads on tap adjusters and hold mechanisms of voltage regulators. Its height is adjustable within a range for a standing operator.

Standard pipe and fittings make up the stand. The base is a piece of steel stock 10 in. in dia. and 2 in. thick. Three fittings on the horizontal bar are for adjusting the position of the work. The whole unit is light enough to be carried around. *Allis-Chalmers Co., Milwaukee, Wis.*

Pipe sections can be connected or disconnected easily when no pipe wrench is handy by wrapping rope around them as shown. The cross bar provides leverage. *Paul Redl, Buenos Aires, Argentine*

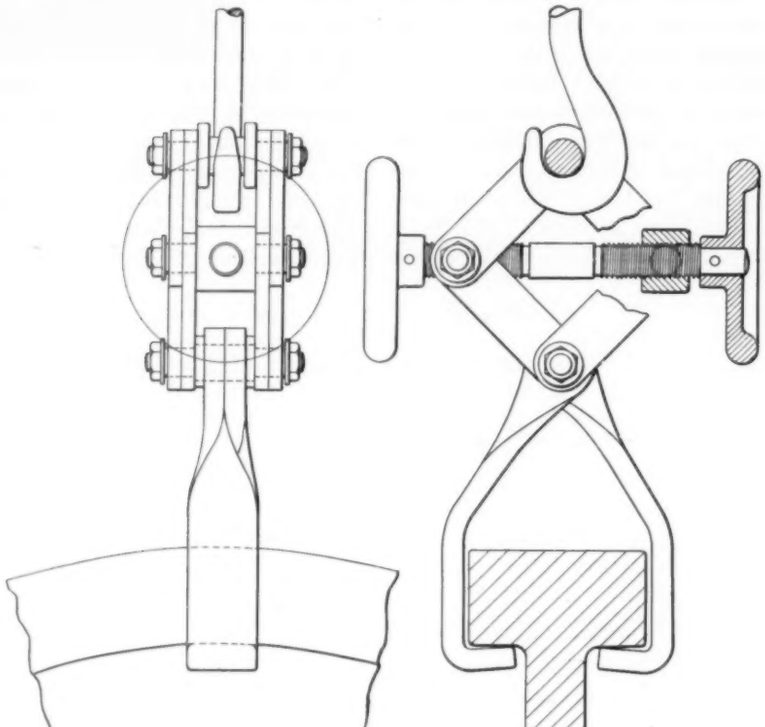


Rugged Punch Pinned to Block

SIMPLE SLOT-PUNCHING is done with this type of construction. Although support is confined to two rods, the punch is rugged and economical.

V-notches are cut in the flat tool-steel insert and holes are drilled in the punch block. The anchor pins are machined with a tapering flat that forces the blade against the top of the slot in the block. These can be installed and cut off so they do not project.

When breakage does occur it is a simple matter to replace the broken punch without removing the block from the machine. *S. Framurz, Bombay, India.*



Ice Tongs Hoist Heavy Loads

ONE OF OUR CRANES, an electric gantry crane, gave us trouble when we were setting up flywheels and other heavy components on a broaching machine. The smallest vertical movement was ¼ in., but we had to position closer than that to start the components on the keyway-type broaching adapter.

To overcome our time-wasting trial and error blocking, we attached a heavy-duty ice-tongs clamp between the crane and the part. The screw, links and wheels were easy to make, and the device made positioning and pushing the work onto the shaft of the adapter much easier.

Two wheels were made to provide control from either side, and the linkage was made double, for strength and to center the load exactly. The same simple device has many applications and can be made in many sizes. *G. R. Milner, Gainsborough, England.*

NEWS OF METALWORKING

Three Standardization Projects Presented at Meeting of ASME

NEW YORK—Three standardization projects affecting every American factory and home were presented to the Council of the American Society of Mechanical Engineers at the 69th annual meeting Nov. 28-Dec. 3 at the Hotel Pennsylvania.

The three were: unification of the American and British standard systems of screw threads, the drafting of a standard American plumbing code and an unfired pressure vessel code.

Nearly 7,000 engineers attended the six-day series of sessions.

Ultimate replacement of the conventional loom with a new type of precision-built weaving machine, an American-made prototype of the Sulzer model developed in Switzerland, was forecast by Myron S. Curtis of Cleveland, director of engineering of the Warner & Swasey Co. He said that first models of the machine were now undergoing exhaustive tests and will be placed in sales production as soon as all tests are satisfactorily met. The machine is precision-built according to the best machine-tool practice, and the individual parts are designed to be made according to the best American mass production methods, Mr. Curtis explained.

Automation Cited

A mechanical brain and mechanical fingers and hands that handle valve guide bushings through a series of machine operations with a delicate and accurate touch that surpasses human handling, is now in operation at the Ford Motor Co., Nevin L. Bean, director of production engineering, Highland Park Mfg. Operations, reported.

Labeled "automation," a word coined for the purpose (*A.M.*, Oct. 21), to denote the automatic handling of parts in the process of manufacture that eliminates the delays and inefficiencies resulting from causes listed as human elements, the system was applied to the manufacture of valve guide bushings which are used in Ford and Mercury cars and Ford tractors. The mechanical brain will quickly catch and turn at 180° any bushing that might be progressing through a tube or chute with the wrong end forward, he said.

The bushings are produced at the rate of 100,000 a day and their manufacture provides the nearest approach to complete automation. As the bushings are conducted from operation to operation, Mr. Bean said, almost every movement is mechanized by means of electrically-operated controls—mechanical fingers and mechanical hands—and requires no human effort other than a spot inspection to see, that quality is maintained.

High Temperatures Noted

Instruments capable of measuring and controlling temperatures vastly higher than any now in industrial use will have to be provided in the future by the industrial instruments business, E. G. Bailey, vice president, Babcock & Wilcox Co., New York, and also founder and president of the Bailey Meter Co., Cleveland, told the ASME.

Electric generating units of 150,000 kw. are now under complete automatic control, Mr. Bailey said. In blast furnaces, smelters, heat treating furnaces and rolling mills, the metallurgical industry is using instruments "to increase production, decrease cost of fuel consumption and improve the quality of the product."

Higher Temperatures Seen

He pointed out that only temperatures of steam and other process fluids would be above those now in use but that temperatures from combustion of fuels will undoubtedly be above those now considered useable, by several hundred degrees.

American industry and engineering, according to Mr. Bailey, speaking at the annual dinner after the presentation of awards, can lead the world toward a solution of its problems of human relations, as they have led it through technical and economic progress toward a higher standard of living. At the same time he warned industry that it must "improve itself from within" and said it "welcomes sound and constructive advice from all professions and classes of people."

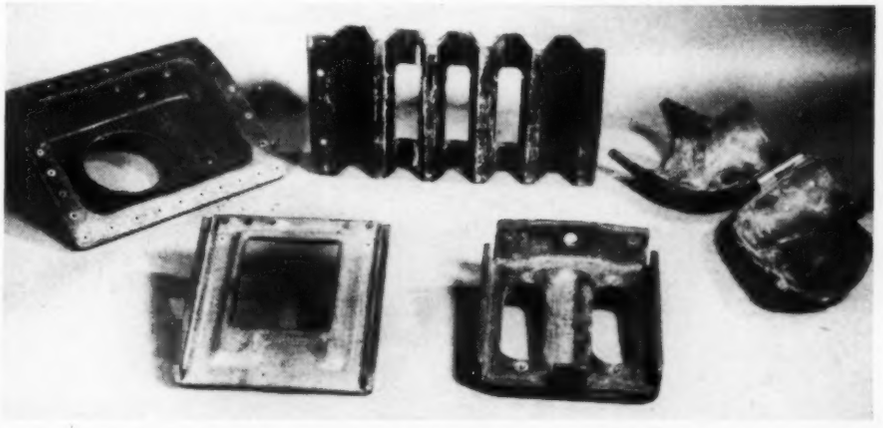
Relations Improved

"The management has been building quietly but firmly and convincingly an excellent relationship between themselves, their employees, their customers, their stockholders and the community. Such companies exist in many different industries. They progressed to this status through real ability and leadership. What has already been done can be

(*Continued on page* 126)

J. M. Todd Installed

NEW YORK—James M. Todd, New Orleans consulting engineer, was installed president of the American Society of Mechanical Engineers at the close of the annual meeting at the Pennsylvania Hotel.



***MOLDED PLASTIC TOOLS** developed by Republic Aviation Corp. are being widely used in place of conventional steel and cast iron for drill jigs, spot welding and routing fixtures. Light in weight and easy to fabricate into the most complicated shapes, the material is a low-pressure laminate of Fiberglas and thermosetting resins*

ASME Meeting

repeated extensively, until the great majority of all industry fits into this pattern, at which time the accomplishments will be unbelievably good," he asserted.

Mr. Bailey said a major change in management, asserting that it is now largely in the hands of competent men who have worked up within the industry and generally within the individual company. While the president, he said, or the chief management officer is employed by and reports to a board of directors, nominally chosen by the stockholders, the management usually selects the nominees for directorships, and in fact runs the company. "This type of management will undoubtedly prove best in the long run in comparison with any previous form of manager-owner-employee relationship."

Honors Presented

Among honors presented were:

Dr. Frederick G. Keyes, chemistry department head, Massachusetts Institute of Technology, ASME Medal for distinguished service in engineering and science.

Edward Smith Cole, president of the Pitometer Log Corp., New York; Worcester Reed Warner Medal, contributions to methods of measuring flow of water in conduits and speed of ships.

Edwin H. Land, president of Polaroid Corp., Cambridge, Mass.; Holly Medal, for work on polarized light.

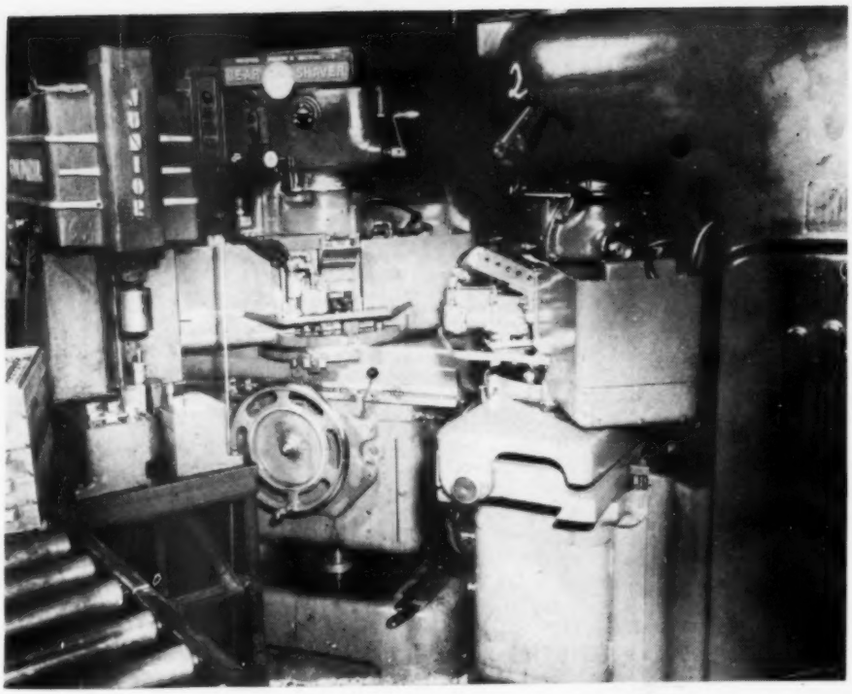
Dr. von Karman, eminent in field of applied mathematics; John Fritz Medal, joint award of the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, and American Institute of Electrical Engineers.

Reginald E. Gillmor, vice chairman of the National Securities Resources Board and former president of the Sperry Gyroscope Co. and now president of the Sperry Corp.; Melville Prize Medal for paper on engineering subject.

Labor Briefs

WASHINGTON—Chances of reaffiliation of the International Association of Machinists with the AFL have brightened since the AFL convention in Cincinnati. Retirement of IAM President Harvey W. Brown may facilitate the move.

WASHINGTON — Boeing Airplane Co. has appealed to the U.S. Court of Appeals in Washington an order of NLRB that it bargain with the International Association of Machinists and reinstate employees who went on strike April 22. The strike ended Sept. 13.



***AUTOMATIC LOADING** on Red Wing GCV-8-in. automatic gear shaving machines has practically tripled production at the Warner Gear Division, Borg-Warner Corp. The pinions being shaved have 12 teeth, 13.5 D.P., 20° P.A., 1 in. P.D. and have a 1 in. face. Stock removal is 0.005 in. over pins and they are diagonally shaved to the elliptoid tooth form, each tooth having 0.0006 in. crown per side. Tolerance on the involute form is 0.0002 in. The operator feeds the pinions with their arbors into the loader magazine and removes the finished pinions as they are ejected*

Continous Strip Mill Considered By French in Lorraine Iron Basin

PARIS (McGraw-Hill World News) —Construction of a new continuous strip mill at Hayange in the Lorraine iron basin is now being seriously considered by French industrialists. Financing is the major problem, and the government will probably have to foot most of the 25 billion franc bill.

Equipment orders to the amount of about $45 million are ready for placing with U.S. firms, and it is understood that the major share of the mechanical equipment will be built by E. W. Bliss, with Westinghouse getting the biggest electrical order. Bliss is reported ready to supply $5 million worth of machinery during the first year of construction. Bids by Mesta Machine Co., Continental Machine Co., and General Electric are, however, still under consideration.

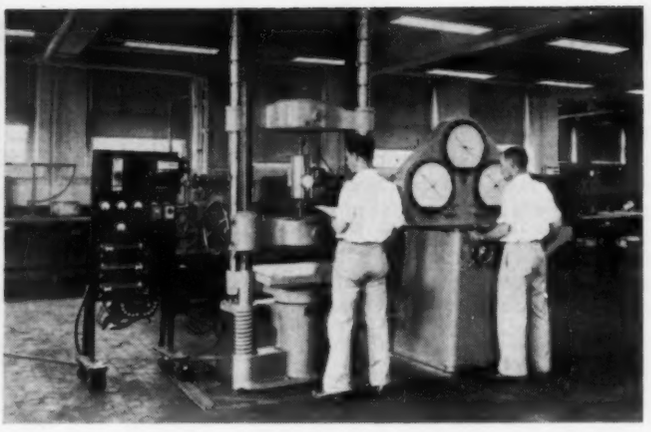
30% Increase Seen

If plans go through, French production of strip steel will be increased about 30%, and exports are expected to rise to 300,000 tons in 1952. Dollars for the project will be put up by ECA, and $12 million have already been written into France's first year Marshall Plan bill. Francs, however will be needed to get the mill under way, about 25 million being required. Half of this will go into ECA's franc counterpart fund and the other half into local materials and labor. The plant will be operated by a private corporation, Societe Lorraine de Laminage Continu, owned by nine leading eastern French steel companies.

600,000 Ton Capacity

The Lorraine mill will have a capacity of 600,000 to 700,000 tons of strip a year, and this, added to the production of the new Denain hot-strip mill and the Montataire cold-strip mill now under construction, will nearly triple the 1948 total French output of 800,000 tons.

Only one-fourth of the manpower per ton required in older mills will be needed by the new mills, an important factor in view of the current critical manpower shortage in the industry. Included in the Hayange project are a million ton capacity cogging mill, a 66-in. hot strip mill, two sand-blasting lines, a continuous cold-strip mill, and a continuous cold-strip tin-plate mill.



***COMPLETE MACHINE SHOP** prepares specimens on which a wide variety of tests are made in the Carpenter Steel Company's new research laboratory at Reading, Pa. At right, a 100,000-lb. Bladwin Southwark Hydraulic machine makes tensile and compression tests and is equipped with curve drawing attachments for automatic recording. The lab was dedicated to those employees who served in the armed forces in World War II*

More Than 300 U. S. Concerns Help Britain Financially, Technically

LONDON (McGraw-Hill World News)—More than 300 U.S. firms with branch plants and associated companies in Britain are playing an important part to help pull British industry over the hump on its hard road to recovery.

The subsidiaries are channeling American technical know-how and the latest American management methods into British industry. They also manufacture many products which the U.S. would otherwise have to import for dollars.

During the past six months, U.S. manufacturers have shown a new surge of interest in the possibilities of opening British branches, or expanding their present operations in the U.S. Some of the interest has been stirred up by ECA's exchange convertibility guarantee. But mostly it reflects two ideas:

1) American businessmen's growing confidence in stability of the pound sterling and 2) their realistic recognition that for a long time to come the world shortage of dollars will close some foreign markets to American-made goods, although British-made goods can be readily sold in the same markets for sterling money.

50 Firms in Talks

At present, almost 50 U.S. firms are angling with the British government for permission to launch new branch manufacturing projects in Britain; some 20 of them contemplate wholly new manufacturing ventures by firms which already have well-established sales offices in Britain. The remainder are initial overtures by firms that up to now have not operated in Britain.

Even without the ECA investment guarantee, American branch firms can still transfer their normal profits back to the U.S. without difficulty. (Ever since the convertibility crisis last year the British government at times has informally advised individual concerns against pulling over large increases in profits and dividends.) British exchange control regulations, on the other hand, tightly restrict capital transfers. But now the ECA guarantee could be used also to insure repatriation of capital—up to 100% of the investment—if desired within 14 years.

There has been no made scramble by U.S. firms to take advantage of ECA's guarantee. So far only nine firms have formally applied to ECA to underwrite their planned new investments in Britain, and one of these nine have since withdrawn their application.

Stiff tests must be met before applications are endorsed, for the amounts guaranteed are charged against Britian's total ERP dollar allocations. The projects must therefore be clearly of a recovery nature. Any machinery or other materials needed for them should be on the list of high-priority goods which Britain already plans to import for dollars anyway, and the projects should form part of Britain's austerity capital investment programs. Most of all, it is expected that their dollar cost will be low in relation to the dollars they will save or earn for the sterling area. In view of these strict tests, it is unlikely that any additional guarantees of private U.S. investments in the U.S. will be approved before next Spring. By April or May, some of the firms which have applied—and possibly others whose applications have not been formally submitted—will become eligible as new funds are freed.

"Slippage" To Help

For by them, some "slippage" is likely to occur as several of the ERP countries may not definitely contract for dollars now allocated to them. And with the "slippage" funds, more investments in the U.K. can be guaranteed before the present U.S. fiscal year ends on June 30, 1949.

J. H. Drury, One of UTD's Original "Big Six," Dies

WEST NEWTON, MASS.—J. Henry Drury, one of the original "Big Six" who formed the Union Twist Drill Co., Athol, in 1905, coming from Brown & Sharpe Co., Providence, R. I., died here recently.

For many years he was sales manager as well as treasurer and was often described as one of the best salesmen who ever sold a cutter or drill.

He was born in Marysville, Calif., in 1864, moving to Providence five years later, then to Athol in 1905 and finally here.

C. Edward Price, Head of Peninsular, Succumbs

DETROIT—C. Edward Price, president of the Peninsular Grinding Wheel Co. and a director of North American Aviation Corp., died at the Henry Ford Hospital, Dearborn, at the age of 43.

He joined Peninsular in 1936 as sales manager after serving in a similar capacity for five years with Midwest Abrasives Co., now located in Owosso. He became president of Peninsular in September, 1946.

Before coming to Detroit he served in the sales organizations of several large concerns. He was a former test pilot for the Wright Aeronautical Corp.

Punched Cards Used to Control Milling of Dies in New Process

DETROIT — Control of the tool movements of a contour milling machine by standard business-machine punched cards is made possible by a process developed by Parsons Industries, Inc., Traverse City, Mich. Complex forging dies can be machined in days, rather than weeks, with the new Cardomatic Process.

Blueprint specifications are first translated into engineering figures which define the desired shape. These figures are put into an International Business Machine calculating machine that punches them on cards.

Tolerance of 0.003

The punched cards are put in the control mechanism of the milling machine and guide the cutter to produce the shape required. The machining is said to be done to a tolerance of 0.003 in. for each quarter-inch square of die surface, in contrast to conventional hand methods which are said to end up with a cumulative error of about 0.01 in.

In addition to eliminating the making of templets and shortening time for machining, engineering changes can easily be made by removing the cards involved and replacing them with new cards.

Trace Control Helps

The Cardomatic process functions best on the less complex type of die—a current example is a die for an aircraft wind section. Complex dies can still be done better on machines which are tracer controlled to follow a model.

Cooperating with Parsons in the development was Snyder Tool & Engineering Co., Detroit, who will build the machines, and I.B.M. When the machines are ready for distribution, they will be marketed by Parsons Industries.

Power Shortage Affects Aluminum

SEATTLE—Growing power shortages in the Pacific Northwest have caused the Bonneville Power Administration to cancel interruptible contracts for 82,000 kw. of aluminum load supplied to five metal plants.

Cut back were the Aluminum Co. of America at Vancouver; Permanente Metal Corp., Spokane; Reynolds Metals Co., Longview, Wash., and the Electro-Metallurgical Corp., Portland, Ore. The Reynolds plant at Troutdale, Ore., was not affected by the action because it is being operated on power not exceeding its firm contract.

Serious drops in stream levels of the lower Columbia and Snake rivers necessitated immediate cutbacks, Paul J. Raver, Bonneville administrator, said. He doubted that any of the cuts could be restored until next spring.

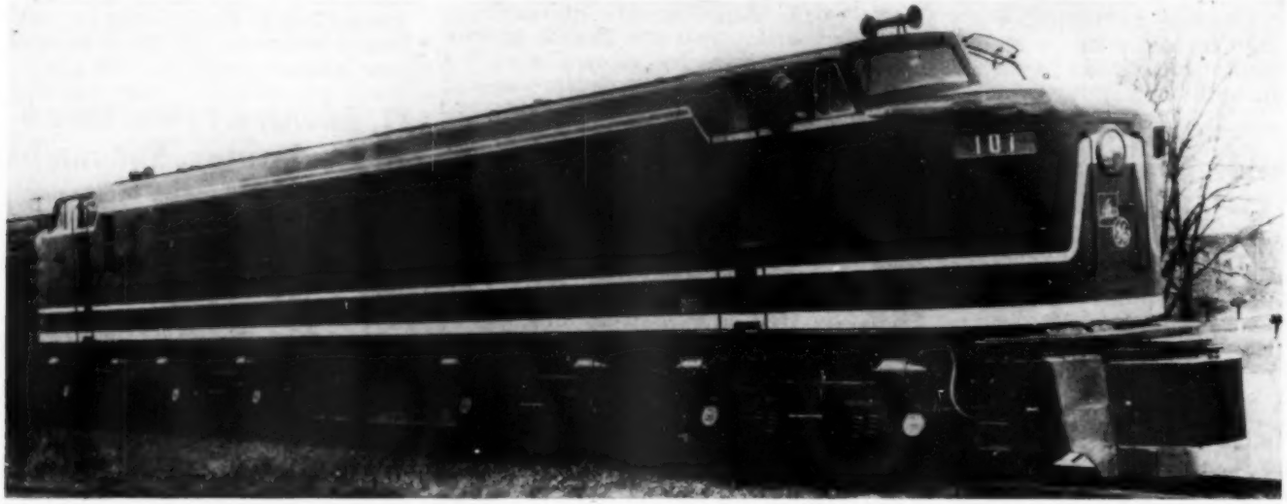
One of Alcoa's five pot lines at Vancouver has been shut down. Production at the Longview plant was expected to be dropped about 10%. Power imported from British Columbia, 360,000 kwh. daily, divided between Alcoa at Vancouver and Kaiser's Spokane plant has allowed Permanente to keep all six of its pot lines going for the present.

Dr. Max Kronenberg

***DR. MAX KRONENBERG** has established a consulting service with offices at 15 East 8th Street, Cincinnati 2, Ohio. He had been associated with the research department of the Cincinnati Milling Machine Co. for nearly 12 years. He will specialize in machine tools, production methods, metalworking research, domestic and foreign patents*

Mesta Observes 50th Anniversary

WEST HOMESTEAD, PA. — The 50th anniversary of the founding of the Mesta Machine Co. was observed Nov. 21. The merger of the Leechburg Foundry & Machine Co., the controlling interest of which was held by George Mesta, and the Robinson-Rea Mfg. Co., Pittsburgh, was completed in 1898.



***FIRST GAS TURBINE-ELECTRIC** locomotive to be built and operated in the United States is shown in preliminary track tests at Erie, Pa. A joint undertaking of the American Locomotive and General Electric companies, the locomotive represents a new type of motive power. The unit is an Alco-GE 4500-hp.*

Restrictions on Economic Curbs Proposed by 53rd NAM Congress

NEW YORK—Four restrictions on compulsory economic controls that might be adopted by the new Congress were included in a resolution adopted by the National Association of Manufacturers at the three-day 53rd annual Congress of American Industry. The checks proposed were:

1) limiting of controls to those absolutely necessary to national defense; 2) close cooperation with industry on their administration; 3) provision for their review by Congress at intervals to determine whether their continuation is warranted; and 4) their elimination as soon as possible to meet civilian needs.

Marshall Plan Seen Working

At the opening session Dec. 1 at the Waldorf-Astoria, Paul G. Hoffman, head of the Economic Cooperation Administration asserted that the Marshall Plan was working and that if the United States and other free nations would stick together a third world war would be prevented. He said that the best way to immunize Europe against communism was to raise the standard of living, and pointed out the production gains in the countries receiving ECA help. The members of the NAM immediately after Mr. Hoffman's talk adopted a resolution commending him and his associates.

Foreign and domestic teamwork on all problems was the keynote of the convention.

Cooperation Urged

Cooperation of American business men with British industrialists to help Britain boost production was cited by Philip D. Reed, chairman of the General Electric Co. Mr. Reed, who has just returned from a trip to Europe, called for international cooperation "of a high order" for the preservation of democracy.

The majority of 500 members attending a panel discussion on the outlook for labor-management relations favored a fight by the NAM to preserve the "sound principles" of the Taft-Hartley Law.

Matthew Woll, vice president of the American Federation of Labor, without mentioning the Wagner Act, spoke of revision instead of repeal of the Taft-Hartley Law. Cooperation of the NAM was promised along these lines.

Election returns show that the government is in business to stay, Ira Mosher, chairman of the NAM finance committee, told the meeting. He claimed that business men as well as farmers and workers had put the government into their businesses for "purely selfish reasons," and that the public really wants this situation.

Former assistant secretary of state, Spruille Braden, warned that the U.S. must keep itself powerful enough economically and militarily to discourage aggression.

W. F. Bennett NAM Head

NEW YORK—Wallace F. Bennett, president of Bennetts, a Salt Lake City paint and varnish concern, was elected president of the National Association of Manufacturers, succeeding Morris Sayre, president of Corn Products Refining Co.

Six directors-at-large were also elected and thirty-six state directors.

Army To Tell Air-Lift Story

PHILADELPHIA—The story of the Army's gigantic materials handling problem in connection with the Berlin air lift will be told at the materials handling conference of the American Society of Mechanical Engineers which will run concurrently with the Materials Handling Show in Convention Hall Jan. 10-14.

Two hundred and twenty-five exhibitors will take part in the Show and more than 100,000 sq. ft. of space will be utilized for the exhibits.

The Show is sponsored jointly by Materials Handling Institute and the ASME division.

Service Credit Clear of Strike

WASHINGTON—An employer who takes back a striker cannot discriminate against him in regard to his tenure in the job. Therefore, he cannot deduct time off on strike from his continuous service credit toward seniority. That is the ruling of NLRB in a decision involving General Electric Co. and the CIO Electrical Workers Union.

The issue arose as an aftermath of the nine-week strike in 1946. After the strike, GE deducted nine weeks from the service credit of all strikers. NLRB said this could not be done insofar as it affected seniority, but permitted it with respect to vacations and pensions, which do not affect job tenure.

***STANDARDIZATION** pact on screw threads was signed last month in Washington by U.S., British and Canadian representatives at the National Bureau of Standards. Left to Right, T. R. B. Saunders, minister of supply, Great Britain; Dr. Edward U. Condon, director of the National Bureau of Standards; William L. Batt, chairman of the Sponsors Council, and C. D. Howe, minister of trade and commerce, Canada*

Detroit

AUTO INDUSTRY'S INVESTMENT IN PRODUCTION MACHINERY DOUBLED SINCE 1941 . . . EASING MARKET CAUSES CONCERN

That the automobile industry is the largest user of machine tools is well known, but a new analysis by the Automobile Manufacturers Assn. gives point to its scope. Since 1941, says AMA, the industry's investment in production machinery has more than doubled.

Vehicle and parts plants have about 400,000 production machines, according to this tabulation, valued at $2.5-billion. Nearly 200,000 machines have been added to facilities since 1941. The savings in these machines, however, cannot now be fully utilized due to continuing shortages in steel.

The reconversion program of the auto industry is now about completed, as is aptly indicated by the fact that orders of consequence continue on a low level on machine tool makers' books. Some special machine tool companies, incidentally, are feeling the pinch enough that they are going somewhat out of their field and seeking die work.

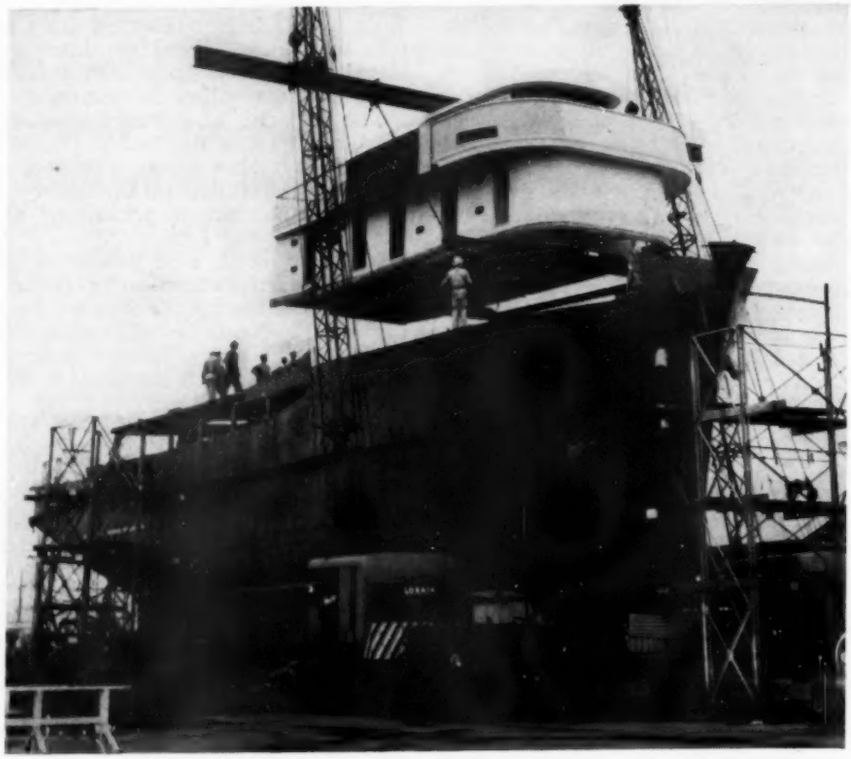
Price-Cutting Felt

A fair degree of price-cutting also appears to be present. Detroit machine tool companies have found themselves underbid on jobs on this account. Work continues to drift out of town. The answer, as Detroit machinery makers see it, is more efficiency in their own shops, enabling lower quotations.

Efficiency is improving all the time, but some fears are that the upward pace may be interrupted by post-election militancy of labor. Since November there have been enlarged cries of "speedup" through the unionized shops, both production plants and specialty producers as well. That these cries are inspired primarily by communist elements in the unions is of no particular consequence: the fact is that they exist, and are driving noncommunists into standing up behind any worker complaints they run into, as a matter of political expediency.

One other factor may come into focus before too long, in the opinion of several observers, which will prove more important than considerations of union politics. That factor is the increasing indication that the passenger car market is beyond its peak.

Auto agencies are still able to deliver all the cars they can get. But more and more of them are no longer requiring trade-ins. The loading of accessories onto the deliveries is diminishing—due in part, to be sure, to the recent Congressional inquiries into such "packs." The volume-make cars are still about as hard to get as ever since the war ended, but others are coming into better supply. When this reaches the point that schedules are likely to be affected, a reaction of improved work is expected.



***DECKHOUSE AND PILOTHOUSE** subassembled at ground level is hoisted aboard the tuna board Carol Virginia, under construction at San Diego. This method saves an estimated 600 manhours in building a 115-ft. welded steel clipper, according to National Iron Works*

The industry is genuinely concerned about the signs in the field that the car market is less robust than it was. Sales meetings are on the increase. Good selling practices are being stressed as never before.

One faint echo of the situation comes in the status of conversion steel requirements. Six months ago auto companies were buying all they could get their hands on, paying up to $200 a ton for sheets produced this way. Their reaction was satisfaction at being able to get the steel.

Of late a few sources have been unable to continue commitments for conversion steel. They expected extreme anger, but found, instead, only mild irritation. Although steel is by no means in notably better supply, that kind of a reaction seems to spell a subtle change.

One other sign, as some persons see it, is the fact that the last of the car models which have not been extensively revamped since before the war are on the thresholds of change—the entire Chrysler Corp. line, and the Pontiac and Chevrolet in the General Motors line.

February Target

Introductions of the new Chrysler models, now about tooled, are being pointed toward a target date of February. They will depart from what has become the orthodox new look—they will be higher, providing more headroom inside. One reason: K. T. Keller and other top company officials have tried out competitive cars and have had their hats knocked off too often, getting in the doors.

The ascending price spiral gives some sign of slowing down. The latest price increases to be announced, coming out of General Motors divisions, averaged close to 3%. The new Cadillacs, equipped with the new high compression type engines, went up an average of 3.2%. The new Buicks were advanced from $50 to $100, up about 3%. (The actual increase on Roadmaster series was $345, but $247.50 of this was represented by dynaflow transmissions.)

Congress Plans Action on Steel Situation in '49

WASHINGTON—Congress is planning to take action on the steel situation next year.

For almost 20 months the Democratic minority in the 80th Congress has been claiming that the steel companies have not increased their capacity enough to meet the nation's needs. Now, with the reinforcements provided by the elections, they are planning for a bill authorizing the government to assure construction of "adequate" capacity by whatever means may be necessary.

Sen. James E. Murray of Montana, slated to head the Senate Small Business Committee, is ready to act as sponsor.

Sen. Murray and others have long been arguing for an increase in basic ingot capacity of 10 to 15 million tons a year with the belief that at least that much will be needed if the U.S. economy is to have enough steel to meet any national emergency and to support continued full employment.

Project Ratios

They got these figures by projecting to 1950 and beyond the steel-to-worker ratios that have been rising steadily since the Civil War. Here is how the ratios have been running:

Annual steel output per worker 0.50 tons in 1900; 1.00 in 1913; 1.35 in 1929 and 1.70 in 1941.

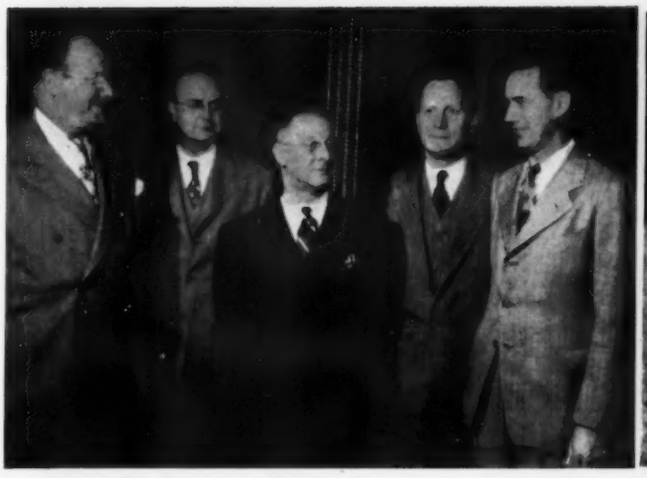
The Democrats assumed that after 1950 each worker will need an average of 1.80 tons of steel a year to keep busy. They also assumed that employment of roughly 60 million workers. Thus, the economy annually would require between 105 and 110 million tons of ingot steel.

Steelmakers, however, did their own forecasting and came up with a different answer. Spokesmen for the industry told a congressional committee last year that even without improved facilities and processes then existing capacity would be adequate to meet all demand.

In addition, the industry was working on a 4-million-ton post-war expansion program; the resulting 95-million-ton capacity—when coupled with an anticipated fall in demand—was expected to be satisfying the universal demand for steel by the end of this year.

Last January Congress finally bought the industry's point of view that expansion was not warranted. However, in many quarters of the industry, steelmen have been revising upward their estimates of steel demand in the future. High construction costs are a check but the proposed bill may aid this.

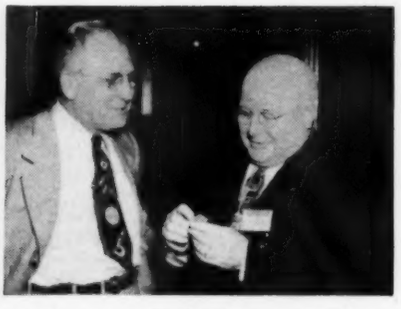
These pictures were taken at the annual meeting of the National Tool and Die Manufacturers Association at Milwaukee Nov. 14-17, at which time officers were elected. The 1949 Convention will be held in the Hotel Pennsylvania, New York City, on Oct. 30 through Nov. 2.



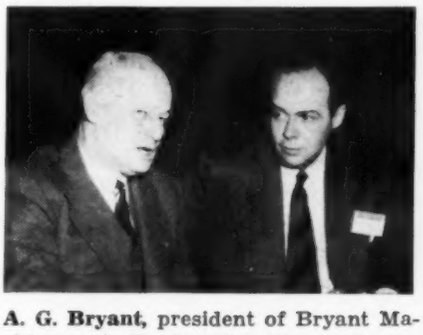
NEW OFFICERS of NTDMA (l to r) secretary, Alfred Reinke, Gus Reinke Machinery & Tool Co., Hillside, N. J.; first vice president, Centre W. Holmberg, Aug. W. Holmberg & Co., Inc., New York; president, J. J. Kohl, International Tool Co., Dayton; second vice president, R. H. Cope, Bunell Machine & Tool Co., Cleveland; and treasurer, Jerome H. Stanek, Stanek Tool & Mfg. Co., Milwaukee

George S. Eaton, executive secretary, NTDMA

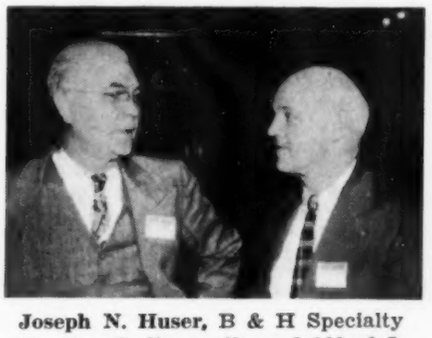
Richard F. Moore, president, Moore Special Tool Co., Bridgeport, Conn., and a director of NTDMA, and H. B. Cleereman, president, Cleereman Machine Tool Co.



Willis G. Ehrhardt, managing partner, Ehrhardt Tool & Machine Co., St. Louis, and William L. Warrander, Tools & Gages, Inc., Cleveland



A. G. Bryant, president of Bryant Machinery & Engineering Co. and vice president of Cleereman Machine Tool Co., seated at luncheon table with William R. White, Jr., retiring president of NTDMA and vice president of Midwestern Tool Co., Chicago



Joseph N. Huser, B & H Specialty Co., Inc., Indianapolis, and Alfred J. Craig, Precision Products, Inc., Cleveland

Officials, Guests at NTDMA Sessions

Names in the News

Harry Conn

R. C. Brown

Harry Conn has recently been appointed chief engineer for Scully-Jones and Co.

Carroll Edgar has been appointed representative in the Seattle area for the Kennametal, Inc., Latrobe, Pa.

Harrison J. Groo and **Robert Bennet** have joined the Cosa Corp., as sales engineer for the Metropolitan New York territory and district sales manager in New England territory, respectively.

Appointment of **Norman Joyce Kilmer** as sales representative for Ohio Electric Lifting Magnets in the Pittsburgh and Wheeling area was announced today by the Ohio Electric Co. of Cleveland. Mr. Kilmer's offices are located in the Frick Building, Pittsburgh.

L. G. Maechtlen has been named general sales manager of the Square D Co., Western Division, of Reincke, Meyer, & Finn, Inc., Chicago.

George C. McClure will become executive vice president in charge of operations of Hercules Steel Products Corp., Galion, Ohio.

William J. McGraw has been named manager of the Cleveland branch of the Independent Pneumatic Tool Co., Aurora, Ill., manufacturers of Thor portable power tools. His former position of manager of electric tool sales in the New York territory will be filled by **Ed B. Rosell.**

John A. Proven has been appointed general sales manager of the Porter-Cable Machine Co., Syracuse, N. Y.

R. C. Brown has been appointed director of sales for Foote Bros. Gear and Machine Corp. Before joining this company, he was president of Brown-Steele Co., Dallas, Texas.

Arthur R. Collins has been appointed general manager of Division III, Stewart-Warner Corp., Chicago, heating equipment division at Indianapolis, Ind. **E. G. Fossum** has been appointed assistant to James S. Knowison, president of Stewart-Warner Corp.

M. G. McGregor has been appointed sales manager for the Ahlberg Bearing Co., Chicago.

James W. Fatkin has been elected manager of manufacturing for the Aviation Gas Turbine division of the Westinghouse Electric Co.

Hans A. Bohuslav has been named special engineering consultant to R. G. LeTourneau, president of R. G. LeTourneau, Inc., Peoria, Ill., and Longview, Texas.

J. T. Gillespie, Jr., has been appointed sales manager, Watson-Stillman Co., Roselle, N. J.

The appointment of **Leonard G. Taggart** as director of purchasing for Sylvania Electric Products, Inc., was announced November 17. He was formerly manager of purchasing for the company's Radio Tube Division.

Dr. Robert B. Freeman has been appointed chief metallurgist for Columbia Steel Co., succeeding Gordon L. von Planck, who was named metallurgical consultant.

Appointment of **McMillan Robinson** of Philadelphia as sales manager for the Metal Products Division of Koppers Company, Inc., was announced recently.

W. E. Madden has been appointed vice president of George Haiss Mfg. Co., Inc., N. Y. George Haiss Co. is a subsidiary corporation of Pettibone Mulliken Corp., Chicago.

Richard Hoagland has been appointed as chief engineer of Automatic Arc Welding Applications, it was announced by Acme Pattern and Machine Co., Inc., designers and builders of Tools, Dies and Special Machinery at Buffalo, New York.

William J. Hall

William J. Hall has been appointed production manager of the Ivanhoe Division of the Reliance Electric & Engineering Co., electric motor manufacturers of Cleveland and Ashtabula.

Obituaries

Joseph B. Fuerst, 51, president of the Triangle Screw Products Co., Dayton, Ohio, died Nov. 10. Mr. Fuerst had been associated with Dayton manufacturing for a number of years.

Melvin Munson, 62, vice president of White Tool & Supply Co., died Nov. 9 in Cleveland, Ohio.

Daniel G. Thompson, 44, manager of manufacturing for the heating device and fan divisions in the Bridgeport and Allentown, Pa., works of the General Electric Co., died suddenly Nov. 9.

Edward S. Morehouse, 73, West Hartford, Conn., assistant treasurer of Niles-Bement-Pond Co., died Nov. 3.

Another Special Machine by Cross

More Manifolds with *Fewer* Man Hours

The production advantages of this new manifold finishing machine prove the soundness of the Cross method of creating such equipment. From the moment that one of the large automotive companies first broached this project, Cross field technicians and engineers started probing for facts which might affect the design and type of machine. They consulted with the motor company's management, with its production engineers, product engineers, maintenance engineers, and factory-trained mechanics . . . they dug out every bit of data . . . considered every production angle. The result: a machine which will provide the lowest cost per piece for many years to come.

Regardless of your production problem, it will pay you to "Consult Cross to Cut Costs."

PART: Automobile Dual Carburetor Intake Manifold.

OPERATION: Machine complete except for milling.

PRODUCTION: 155 pieces per hour.

EQUIPMENT: Cross Special Five-Station Trunnion Machine.

FEATURES: ☆ Five-station power operated index trunnion ☆ Four pieces cut at a time progressively ☆ Independent station for loading and unloading work while machine is cutting ☆ Fluid drive index with overload protection for safety ☆ Flexibility for part design changes through use of standard index assemblies and standard way type feed units ☆ Hydraulic feed for drilling and reaming ☆ Lead screw feed for tapping ☆ Hardened and ground steel ways.

Investigate Cross Transfer-matics—the newest machine tool development for continuous automatic production.

THE **CROSS** COMPANY

Established 1898

SPECIAL MACHINE TOOLS

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

DETROIT 7, MICHIGAN

Starrett HACKSAWS

"S-M" MOLYBDENUM for hand sawing and for light and heavy power sawing, these blades are of special temper for high speed cutting and for hard metals. They have a remarkable record of performance and low cost per cut.

HIGH SPEED STEEL 18-4-1 Tungsten all hard blades for light and heavy power sawing to assure fast production on high alloy metals, stainless steel, phosphor bronze, tool steels, chrome steel, Monel metal and the like.

SAFE-FLEX for hand sawing — a high speed steel blade with hard edge and flexible back, a combination that makes it virtually unbreakable on the toughest hand sawing jobs.

STANDARD Flexible Back, All Hard and "Semi-Flex" in the right size and teeth per inch for hand sawing jobs of all sorts. Fast cutting, long lived, thoroughly reliable.

HACK SAWS
BAND SAWS

BAND SAWS

for Cutting Metal, Wood and Plastics

METAL CUTTING BAND SAWS with hard edge and flexible back, available in 10 widths, 3 gauges and 8 pitches, in coils of any desired length, or cut to length and welded ready to use.

"SKIP-TOOTH" BAND SAWS for fast cutting of magnesium, aluminum, bronze, soft brass and other nonferrous metals; also for special compositions, fibre, bakelite; plastics and wood.

Specify "Starrett" Wavy Set Band Saws For Use On All Horizontal Band Saw Machines

Write for Starrett Hacksaw and Band Saw Booklet "C"

Starrett

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS • DIAL INDICATORS • STEEL TAPES • HACKSAWS AND BAND SAWS • PRECISION GROUND FLAT STOCK
Buy Through Your Distributor

THE L. S. STARRETT CO. • *World's Greatest Toolmakers* • **ATHOL, MASSACHUSETTS, U.S.A.**

Weight Tables for Screw-Machine Products...I

COURTESY: NATIONAL SCREW MACHINE PRODUCTS ASSOCIATION

THESE net-weight, no-allowance tables were developed for the National Screw Machine Products Association by the Pittsburgh Testing Laboratory from mill-run samples. No reliance was placed on theoretical densities of materials. Thus, the tables are based on the actual densities of a specific kind of steel, of brass and of aluminum. These materials are respectively: C-1117 steel, free-cutting brass and 11-St aluminum. Conversion factors are supplied for use when other grades of material are involved, and for squares and octagons.

The advantage of using a table based on actual densities is this: weight of materials needed in screw machine products is a manufacturing cost factor. Other factors in cost of producing the product may involve some speculation. But the weight need not be speculative. It should be precisely calculated because the relation of material cost to total cost can vary all the way from 5% to over 80%. Therefore, all the weights tabulated are net to average densities from mill samples and to maximum allowable tolerances.

For convenience the NSMPA tables are designed for decimal-system use. Thus, the weights are expressed in pounds per 1000 in. And knowing the length per piece and multiplying this by the tabulated weight for 1000 in. of material, one automatically gets the weight per 1000 pcs. But also for the convenience of people accustomed to work in terms of weight per foot of stock, the weights in pounds per foot are also tabulated.

Another feature of the tables is the loss in material for bar ends that must be added to the calculation. This information is tabulated in terms of percentage of various lengths of bars.

One example of weight-estimating procedure follows:

Material:

Brass—11/32-in. round
Bar end length—2½ in.
Length of bar—12 ft.

Quantity:

125,000 pcs.

Dimensions:

Part length ...1.041
Facing 0.010
Cut-off 0.085

Total 1.136 in.

From tables (pages 137 and 139):

Weight per 1000 pcs. = 1.136 × 28.65 = 32.55 lb.
Weight 125,000 pcs. = 4069 lb.

Bar ends (interpolated) 1.73%
Rejection and set-up loss 5.00%

6.73%

Total weight required = 4069 × 106.73 = 4343 lb.

A calculation of this type can be performed in 2 min.

MATERIAL LOSS CHART (BAR ENDS)

—EXPRESSED IN PERCENTAGE—

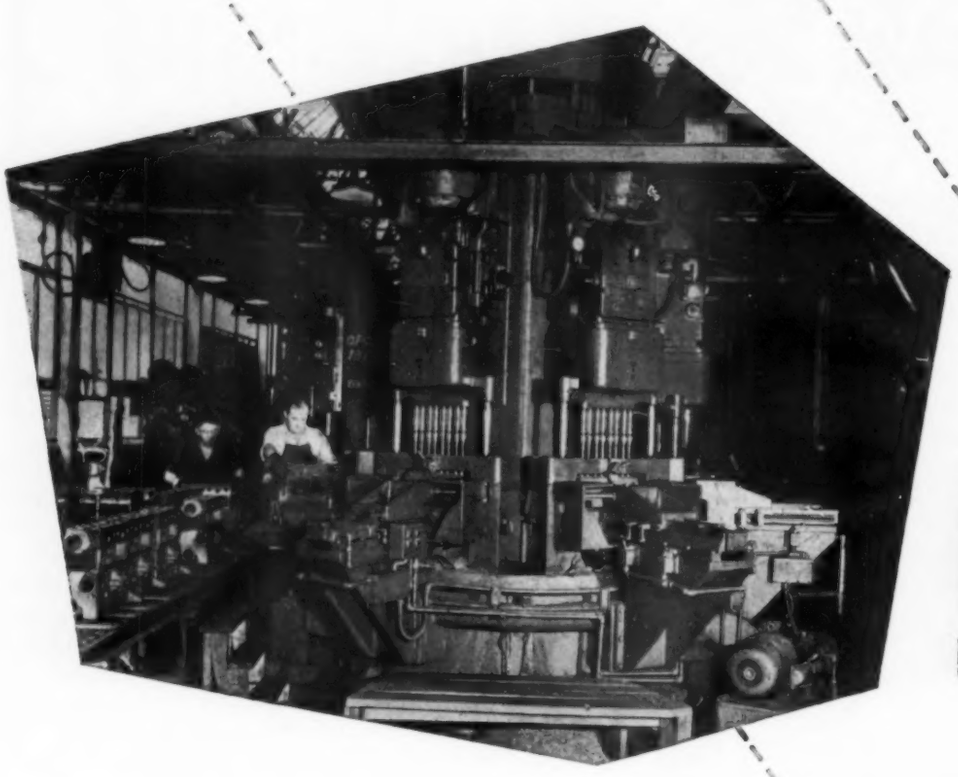
	6'	8'	10'	12'	14'	16'	18'	20'
1"	1.39	1.04	.83	.69	.59	.52	.46	.42
2"	2.78	2.08	1.66	1.39	1.19	1.04	.93	.83
3"	4.17	3.13	2.50	2.08	1.79	1.56	1.39	1.25
4"	5.56	4.17	3.33	2.78	2.38	2.08	1.85	1.67
5"	6.94	5.21	4.17	3.47	2.98	2.60	2.31	2.08
6"	8.35	6.25	5.00	4.17	3.57	3.13	2.78	2.50
7"	9.72	7.29	5.83	4.86	4.17	3.65	3.24	2.92
8"	11.11	8.33	6.66	5.56	4.76	4.16	3.70	3.33
9"	12.50	9.38	7.50	6.25	5.36	4.68	4.17	3.75
10"	13.88	10.41	8.33	6.95	5.95	5.20	4.62	4.16
11"	15.27	11.45	9.17	7.64	6.55	5.73	5.09	4.58
12"	16.66	12.50	10.00	8.33	7.14	6.25	5.56	5.00

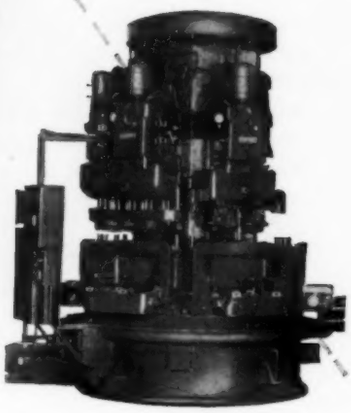
CONVERSION FACTORS

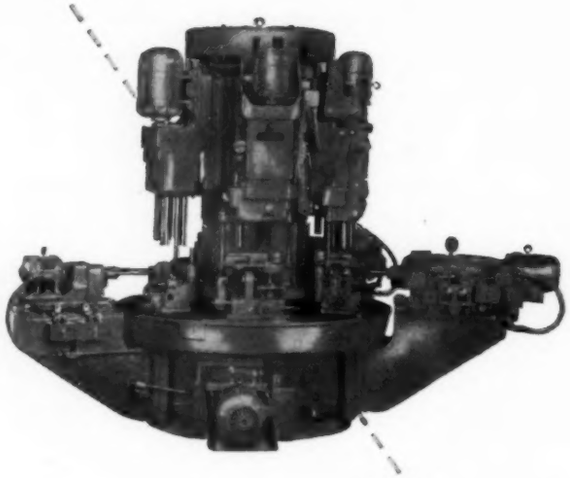
MATERIAL	ROUNDS BASED ON ROUNDS	HEX BASED ON HEX	SQUARE BASED ON HEX	OCTAGON BASED ON HEX
Steel C-1117	1.000	1.000	1.155	.957
Steel C-1137	.998	.998	1.153	.955
Stainless Steel—No. 303C	1.002	1.002	1.157	.959
Stainless Steel No. 416	.978	.978	1.130	.936
Free-Cutting Brass	1.000	1.000	1.155	.957
Naval Brass	.990	.990	1.143	.947
Type KR Monel Cold Rolled	.993	.998	1.152	.955
Type R Cold Drawn Monel	1.039	1.044	1.205	.999
Grade "A" Cold Drawn Nickel	1.046	1.051	1.214	1.005
Aluminum 11-ST	1.000	1.000	1.155	.957
Aluminum 17-ST	.987	.987	1.140	.944
Aluminum 24-ST	.981	.981	1.133	.939
Magnesium (Dow Metal FS-1)	.628	.628	.725	.601
Magnesium (Dow Metal M)	.627	.627	.724	.600
Magnesium (Dow Metal J-1)	.635	.635	.733	.608

For Round multiply weight for Round in table by factor.
Magnesium based on Aluminum 11-ST
For other shapes multiply weights for Hex in table by factor.

FOOTBURT center column machines







● Footburt center column type machines are being used to machine automotive cylinder blocks, cylinder heads, flywheels, steering spindles and many smaller parts made in large quantities. Work holding fixtures mounted on an indexing ring table are progressed from station to station. With this design several drilling, reaming, boring or tapping heads are mounted on one machine frame, thus saving a large amount of floor space and greatly reducing equipment cost compared with the use of separate machines for each operation. This is representative of Footburt "Engineering for Production". We will be glad to work with you on your problems.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

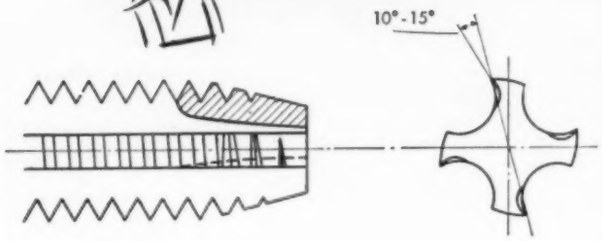
Detroit Office: General Motors Building

FOOTBURT MACHINE TOOLS *Engineered* FOR PRODUCTION

Weight Tables for Screw-Machine Products...II

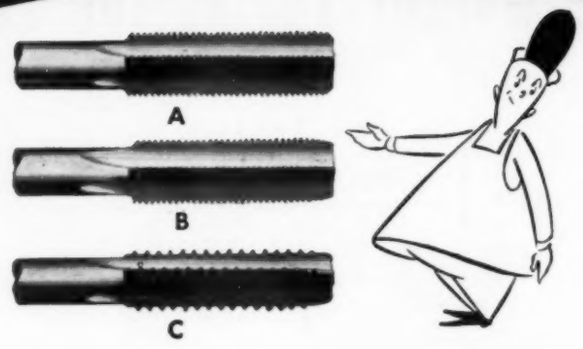
SIZE IN INCHES	STEEL				BRASS				ALUMINUM			
	ROUND		HEX		ROUND		HEX		ROUND		HEX	
	LB. PER 1000 IN.	LB. PER FOOT	LB. PER 1000 IN.	LB. PER FOOT	LB. PER 1000 IN.	LB. PER FOOT	LB. PER 1000 IN.	LB. PER FOOT	LB. PER 1000 IN.	LB. PER FOOT	LB. PER 1000 IN.	LB. PER FOOT
1/32	.2167	.00260	.2389	.002866	.257	.00308	.309	.00371	.08074	.00097	.09548	.00114
3/64	.4875	.00585	.5375	.006450	.563	.00675	.658	.00790	.1843	.00221	.2073	.00249
1/16	.8667	.01040	.9556	.011468	.982	.01179	1.138	.01366	.3239	.00389	.3628	.00461
5/64	1.3542	.01625	1.4934	.017920	1.524	.01829	1.744	.02093	.5091	.00611	.5686	.00682
3/32	1.950	.02340	2.150	.02580	2.185	.02622	2.491	.02989	.7281	.00874	.8122	.00975
7/64	2.654	.03185	2.927	.03512	2.959	.03551	3.354	.04025	.9882	.01186	1.099	.01319
1/8	3.467	.04160	3.822	.04588	3.847	.04620	4.342	.05211	1.286	.01543	1.429	.01715
9/64	4.388	.05264	4.838	.05806	4.850	.05821	5.462	.06559	1.621	.01946	1.801	.02162
5/32	5.417	.06500	5.972	.07168	5.976	.07176	6.717	.08061	1.998	.02398	2.219	.02662
11/64	6.554	.07865	7.228	.08672	7.223	.08667	8.100	.09721	2.414	.02897	2.678	.03214
3/16	7.800	.09360	8.602	.10320	8.593	.1031	9.619	.1154	2.872	.03448	3.182	.03818
13/64	9 154	.10985	10.094	.12110	10.05	.1206	11.26	.1351	3.359	.04032	3.728	.04473
7/32	10.615	.12740	11.700	.14050	11.65	.1398	13.03	.1564	3.895	.04675	4.317	.05180
15/64	12.190	.14620	13.440	.16120	13.37	.1605	14.93	.1792	4.470	.05365	4.949	.05938
1/4	13.87	.1664	15.29	.1835	15.20	.1824	16.96	.2035	5.081	.06100	5.623	.06750
17/64	15.66	.1878	17.26	.2071	17.15	.2058	19.12	.2294	5.733	.06880	6.348	.07616
9/32	17.56	.2106	19.35	.2322	19.21	.2306	21.41	.2569	6.423	.07709	7.108	.08530
19/64	19.56	.2346	21.56	.2587	21.40	.2568	23.83	.2860	7.152	.08584	7.913	.09498
5/16	21.67	.2600	23.89	.2867	23.69	.2843	26.38	.3165	7.920	.09506	8.762	.1051
21/64	23.89	.2866	26.34	.3161	26.11	.3133	29.05	.3486	8.728	.1047	9.652	.1158
11/32	26.22	.3146	28.91	.3469	28.65	.3438	31.86	.3824	9.577	.1149	10.59	.1271
23/64	28.65	.3438	31.60	.3792	31.29	.3756	34.80	.4176	10.46	.1255	11.58	.1388
3/8	31.20	.3744	34.41	.4128	34.07	.4088	37.86	.4544	11.39	.1367	12.59	.1511
25/64	33.85	.4063	37.33	.4479	36.95	.4432	41.06	.4926	12.35	.1482	13.66	.1639
13/32	36.62	.4394	40.38	.4845	39.99	.4796	44.38	.5326	13.36	.1603	14.76	.1772
27/64	39.49	.4738	43.55	.5225	43.09	.5168	47.84	.5740	14.40	.1728	15.92	.1910
7/16	42.47	.5097	46.85	.5619	46.32	.5555	51.43	.6170	15.48	.1858	17.12	.2054
29/64	45.56	.5467	50.25	.6028	49.68	.5958	55.13	.6615	16.60	.1993	18.35	.2202
15/32	48.78	.5850	53.75	.6450	53.14	.6375	58.97	.7076	17.76	.2132	19.63	.2356
31/64	52.05	.6246	57.40	.6887	56.75	.6807	62.97	.7554	18.97	.2277	20.96	.2516
1/2	55.47	.6656	61.16	.7339	60.45	.7251	67.05	.8046	20.20	.2425	22.32	.2679
33/64	59.00	.7080	65.05	.7805	64.40	.7727	71.55	.8585	21.50	.2583	23.78	.2854
17/32	62.62	.7514	69.06	.8285	68.33	.8198	75.92	.9110	22.84	.2741	25.24	.3029
35/64	66.36	.7963	73.17	.8779	72.43	.8692	80.42	.9650	24.21	.2906	26.73	.3208
9/16	70.20	.8424	77.41	.9288	76.60	.9191	85.04	1.0208	25.60	.3073	28.28	.3394
37/64	74.16	.8900	81.77	.9812	80.89	.9703	89.81	1.078	27.04	.3245	29.86	.3588
19/32	78.23	.9387	86.25	1.035	85.32	1.023	94.67	1.136	28.52	.3423	31.50	.3780
39/64	82.40	.9887	90.85	1.090	89.82	1.077	99.69	1.196	30.02	.3603	33.17	.3981
5/8	86.67	1.040	95.58	1.147	94.50	1.133	104.8	1.258	31.59	.3791	34.88	.4186
41/64	91.05	1.093	100.40	1.205	99.24	1.190	110.1	1.321	33.18	.3981	36.65	.4398
21/32	95.54	1.147	105.37	1.264	104.1	1.249	115.5	1.386	34.81	.4177	38.45	.4614
43/64	100.15	1.202	110.44	1.325	109.1	1.309	121.0	1.452	36.43	.4378	40.29	.4835
11/16	104.9	1.258	115.65	1.387	114.3	1.370	126.7	1.520	38.20	.4584	42.18	.5061
45/64	109.7	1.316	120.95	1.451	119.5	1.433	132.5	1.589	39.95	.4794	44.10	.5291
23/32	114.6	1.375	126.40	1.517	124.8	1.498	138.4	1.661	41.74	.5009	46.09	.5530
47/64	119.7	1.436	131.95	1.583	130.3	1.564	144.5	1.734	43.56	.5228	48.11	.5771
3/4	124.8	1.498	137.60	1.651	135.9	1.631	150.7	1.809	45.44	.5452	50.17	.6020
49/64	129.9	1.560	143.4	1.721	141.6	1.699	157.0	1.883	47.34	.5681	52.26	.6271
25/32	135.2	1.625	149.4	1.792	147.4	1.769	163.4	1.960	49.28	.5914	54.42	.6530
51/64	141.0	1.691	155.4	1.864	153.3	1.840	170.0	2.039	51.28	.6153	56.61	.6793
13/16	146.5	1.758	161.5	1.938	159.4	1.913	176.7	2.120	53.30	.6396	58.84	.7061
53/64	152.0	1.826	167.8	2.014	165.6	1.987	183.5	2.202	55.34	.6643	61.13	.7335
27/32	157.9	1.896	174.2	2.090	171.9	2.063	190.4	2.285	57.48	.6897	63.45	.7614
55/64	163.9	1.966	180.7	2.168	178.3	2.140	197.5	2.370	59.61	.7153	65.80	.7896
7/8	169.8	2.038	187.3	2.247	184.8	2.218	204.7	2.456	61.80	.7413	68.21	.8186
57/64	176.0	2.112	194.1	2.329	191.5	2.298	212.0	2.545	64.02	.7680	70.67	.8480
29/32	182.2	2.186	200.9	2.411	198.3	2.379	219.5	2.634	66.28	.7953	73.16	.8780
59/64	188.6	2.263	207.9	2.495	205.2	2.462	227.1	2.725	68.58	.8229	75.70	.9085
15/16	194.9	2.340	215.0	2.580	212.2	2.546	234.8	2.818	70.92	.8509	78.27	.9393

Tips on Tapping ...by Stainless Sam



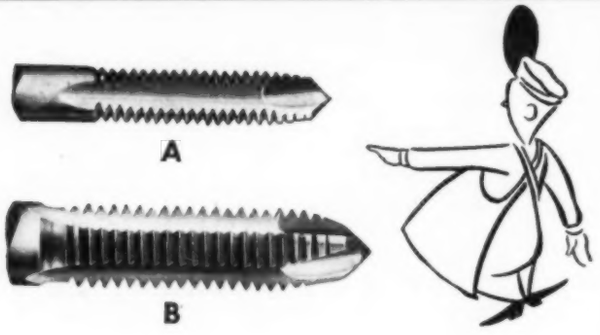
1 A 15° hook grind, which should include the first full tooth, has been found effective in tapping all grades of Stainless Steels. These taps are available commercially, or the hook can be ground in a standard tap as illustrated here.

This is especially important when tapping the chromium-nickel and high carbon grades of Stainless. Free machining grades can be tapped without difficulty when recommended procedures are followed.



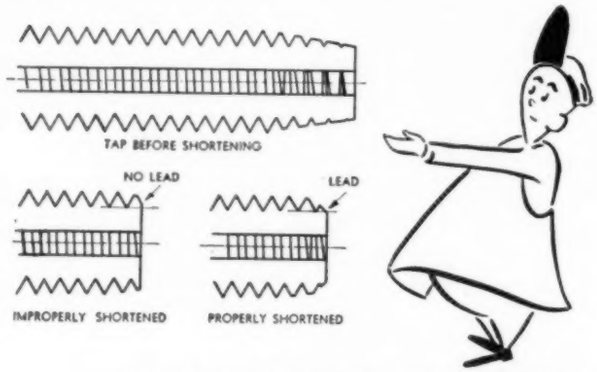
2 Tapping over 75% thread should be avoided if possible. A 50% thread is much easier to tap, and in many cases will hold satisfactorily. Taps should be kept sharp at all times.

For deep hole tapping, thin the lands by grinding the heels to reduce bearing areas as shown here, or use interrupted thread style tap. Figure A is standard ½-20 tap; B is a standard tap with lands thinned; C is interrupted thread ½-20 tap.



3 Collapsible type taps are successfully employed for large sizes (over 1" diameter). It is recommended that collapsible types of tap chasers be ground with a 15°-20° lip hook.

For through holes use two-flute taps, or the gun or chip-driver type as shown in this drawing. Figure A is a two-flute chip-driver tap; Figure B is three-flute.



4 Hints for close tolerance tapping: Up to size No. 6 use a two-flute tap; from No. 6 up to ½", a three-flute tap; over ½" a four-flute tap. Two-flute taps are the strongest, being designed for through holes. A three-flute has less tendency to cut oversize, but has less chip clearance. A four-flute is usually used for larger sizes and deep hole operation. For bottom tapping of all types, be sure you do not destroy the taper lead when shortening the tap. (See drawing).

For complete information on tapping and other machining operations, write for a copy of the new Armco booklet, "Machining of ARMCO Stainless Steels."

If you are not using ARMCO Stainless Steels there is a good chance that parts of your equipment or products could benefit by these rustless metals—often at no increase in cost. ARMCO Stainless resists heat and corrosion, adds strength and beauty to the products you make.

Remember, too, ARMCO Stainless Steel bars, wire and angles are available for quick delivery. In many cases your order can be shipped the same day it is received. Write or wire Armco Steel Corporation, 439 Curtis Street, Middletown, Ohio. Or call our nearest district office or Armco Distributor.

Export: The Armco International Corporation.

ARMCO
STAINLESS STEELS

Weight Tables for Screw-Machine Products...III

SIZE IN INCHES	STEEL				BRASS				ALUMINUM			
	ROUND		HEX		ROUND		HEX		ROUND		HEX	
	LB. PER 1000 IN.	LB. PER FOOT	LB. PER 1000 IN.	LB. PER FOOT	LB. PER 1000 IN.	LB. PER FOOT	LB. PER 1000 IN.	LB. PER FOOT	LB. PER 1000 IN.	LB. PER FOOT	LB. PER 1000 IN.	LB. PER FOOT
61/64	201.6	2.417	222.3	2.667	219.3	2.631	242.7	2.913	73.30	.8794	80.90	.9708
31/32	208.2	2.498	229.6	2.755	226.5	2.718	250.7	3.009	75.71	.9085	83.56	1.003
63/64	215.0	2.580	237.0	2.844	233.8	2.806	258.9	3.106	78.16	.9379	86.28	1.035
1	221.9	2.662	244.6	2.935	241.3	2.895	267.1	3.205	80.67	.9679	89.03	1.068
1- 1/64	228.8	2.746	252.4	3.028	249.1	2.989	276.1	3.316	83.25	.9992	91.91	1.103
1- 1/32	236.0	2.832	260.2	3.122	256.8	3.081	284.5	3.414	85.85	1.030	94.73	1.137
1- 1/16	250.5	3.006	276.2	3.314	272.6	3.271	302.0	3.623	91.14	1.094	100.6	1.207
1- 3/32	265.4	3.185	292.7	3.512	288.8	3.465	319.8	3.837	96.55	1.158	106.6	1.279
1- 1/8	280.8	3.370	309.6	3.715	305.6	3.667	338.4	4.060	102.2	1.226	112.7	1.353
1- 5/32	296.7	3.560	327.1	3.924	322.7	3.873	357.6	4.288	107.8	1.294	119.0	1.428
1- 3/16	312.9	3.755	345.0	4.140	340.4	4.084	376.9	4.523	113.8	1.365	125.6	1.507
1- 7/32	329.5	3.955	363.4	4.361	358.5	4.302	396.7	4.761	119.9	1.438	132.2	1.587
1- 1/4	346.7	4.160	382.3	4.587	377.1	4.525	417.4	5.008	126.1	1.513	139.1	1.669
1- 9/32	364.2	4.370	401.6	4.819	396.1	4.753	438.5	5.261	132.4	1.589	146.1	1.753
1- 5/16	382.3	4.587	421.5	5.058	415.7	4.987	460.0	5.520	138.9	1.667	153.3	1.840
1-11/32	400.6	4.807	441.8	5.301	435.7	5.228	482.0	5.784	145.6	1.747	160.6	1.928
1- 3/8	419.5	5.034	462.6	5.550	456.1	5.474	504.7	6.056	152.5	1.829	168.1	2 019
1-13/32	438.8	5.265	483.8	5.805	476.9	5.723	528.0	6.333	159.4	1.913	175.9	2.111
1- 7/16	458.5	5.502	505.5	6.068	498.4	5.980	551.4	6.617	166.6	1.999	183.8	2.205
1-15/32	478.6	5.743	527.8	6.334	520.4	6.245	575.4	6.905	174.0	2.088	191.8	2.302
1- 1/2	499.2	5.990	550.5	6.605	542.6	6.512	600.2	7.203	181.4	2.177	200.1	2.401
1-17/32	520.2	6.243	573.6	6.883	565.4	6.785	625.3	7.504	190.3	2.284	212.1	2.545
1- 9/16	541.6	6.499	597.3	7.168	588.6	7.064	651.3	7.814	198.1	2.378	220.7	2.649
1-19/32	563.6	6.764	621.4	7.458	612.4	7.348	677.3	8.127	206.1	2.473	229.6	2.754
1- 5/8	586.0	7.031	646.0	7.752	636.8	7.638	704.1	8.449	214.3	2.572	238.6	2.863
1-21/32	608.6	7.302	671.2	8.053	661.3	7.935	731.3	8.775	222.5	2.669	247.7	2.973
1-11/16	631.8	7.582	696.7	8.360	686.4	8.236	759.2	9.110	231.0	2.772	257.1	3.085
1-23/32	655.4	7.865	722.7	8.673	711.8	8.545	787.3	9.447	239.6	2.875	266.5	3.198
1- 3/4	679.4	8.153	749.3	8.992	737.8	8.856	816.1	9.793	248.3	2.980	276.3	3.316
1-25/32	704.0	8.448	776.2	9.315	764.7	9.176	845.5	10.15	257.3	3.087	286.1	3.434
1-13/16	728.9	8.746	803.6	9.645	791.9	9.502	875.5	10.50	266.3	3.195	296.1	3.554
1-27/32	754.3	9.052	831.5	9.980	819.2	9.830	905.8	10.86	275.4	3.306	306.3	3.676
1- 7/8	780.0	9.360	860.0	10.32	847.3	10.17	936.7	11.24	284.9	3.418	316.8	3.801
1-29/32	806.3	9.675	889.0	10.67	875.5	10.51	968.2	11.62	294.4	3.533	327.4	3.928
1-15/16	832.9	9.995	918.4	11.02	904.5	10.85	1000.0	12.00	304.1	3.650	338.1	4.057
1-31/32	860.0	10.32	948.3	11.38	933.9	11.20	1032.0	12.39	313.9	3.767	348.9	4.187
2	887.5	10.65	978.6	11.74	963.7	11.56	1065.0	12.78	324.0	3.888	360.1	4.320
2- 1/16	943.8	11.33	1041.0	12.49	1025.0	12.31	1133.0	13.60	344.4	4.133	384.1	4.610
2- 1/8	1002.	12.02	1105.	13.26	1088.	13.05	1202.	14.43	365.6	4.387	407.7	4.892
2- 3/16	1062.	12.74	1171.	14.05	1152.	13.83	1275.	15.29	387.3	4.647	431.7	5.180
2- 1/4	1124.	13.48	1239.	14.86	1220.	14.64	1348.	16.17	409.7	4.916	456.7	5.481
2- 5/16	1187.	14.24	1308.	15.70	1288.	15.46	1423.	17.07	432.6	5.191	482.0	5.784
2- 3/8	1252.	15.02	1380.	16.56	1359.	16.31	1501.	18.01	456.3	5.473	508.2	6.098
2- 7/16	1318.	15.82	1454.	17.44	1431.	17.17	1581.	18.97	480.5	5.766	535.0	6.420
2- 1/2	1387.	16.64	1529.	18.35	1505.	18.07	1663.	19.95	505.4	6.064	562.6	6.751
2- 5/8	1529.	18.35	1686.	20.23	1661.	19.94	1837.	22.04	557.0	6.684	619.8	7.438
2- 3/4	1678.	20.14	1850.	22.20	1823.	21.88	2013.	24.16	611.2	7.334	679.8	8.158
2- 7/8	1834.	22.02	2022.	24.26	1993.	23.91	2204.	26.44	667.9	8.014	742.5	8.910
3	1997.	23.96	2202.	26.42	2170.	26.04	2400.	28.79	727.1	8.724	807.9	9.696
3- 1/8	2167.	26.00	2389.	28.67	2354.	28.25	2603.	31.24	788.6	9.463		
3- 1/4	2344.	28.12	2584.	31.01	2546.	30.56	2816.	33.79	852.9	10.23		
3- 3/8	2527.	30.33	2787.	33.44	2746.	32.95	3036.	36.43	919.5	11.03		
3- 1/2	2718.	32.61	2997.	35.96	2953.	35.44	3265.	39.18	1002.	12.02		
3- 5/8	2916.	34.99	3215.	38.58	3168.	38.04	3503.	42.03	1074.	12.89		
3- 3/4	3120.	37.45	3441.	41.28	3390.	40.67	3749.	44.99	1149.	13.79		
3- 7/8	3332.	39.98	3674.	44.08	3620.	43.44	4003.	48.04	1226.	14.71		
4	3550.	42.60	3914.	46.97	3857.	46.28	4265.	51.18	1305.	15.67		
4- 1/8	3775.	45.30	4163.	49.95	4104.	49.24	4536.	54.43	1388.	16.65		
4- 1/4	4008.	48.09	4419.	53.02	4357.	52.26	4816.	57.79	1472.	17.67		
4- 3/8	4247.	50.96	4683.	56.19	4617.	55.36	5103.	61.23	1560.	18.72		
4- 1/2	4493.	53.92	4954.	59.45	4882.	58.57	5398.	64.79	1650.	19.80		
4- 5/8	4746.	56.95	5234.	62.80	5157.	61.87	5703.	68.43	1742.	20.90		
4- 3/4	5006.	60.07	5520	66.24	5439.	65.26	6015.	72.18	1837.	22.04		
4- 7/8	5273.	63.25	5814.	69.77	5729.	68.74	6335.	76.04	1934.	23.20		
5	5547.	66.56	6116.	73.39	6027.	72.32	6665.	79.97	2034.	24.41		

Completely finished

in *21* operations* on *1*

NEW BRITAIN CHUCKER

Illustrated at right, close up of 4, 5, 6, 7 and 8 positions.

THIS aluminum balance wheel is converted from rough casting to completed part at the rate of 150 an hour. By finding better methods such as this, the manufacturer succeeds in holding profit margins while keeping the price of one of the best-known sewing machines in line.

Twenty-one operations are performed on a double index New Britain Model 98 Chucker. The result is an excellent finish, and the maintenance of a ± .002 tolerance on the shaft hub O. D. and top of the belt groove.

When a single machine can perform a wide variety of accurate cuts, eliminate all second operations and turn out finished pieces at a high rate . . . that's money-making *production*. You'll find it at its peak where fast, adaptable, accurate New Britain Automatic Screw Machines and Chuckers are at work.

For other specific examples, write for "It Can Be Done"—the portfolio of actual Cost Histories that is yours for the asking.

**For details write for Bulletin 98.*

12 18HG1

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

Shop Equipment News

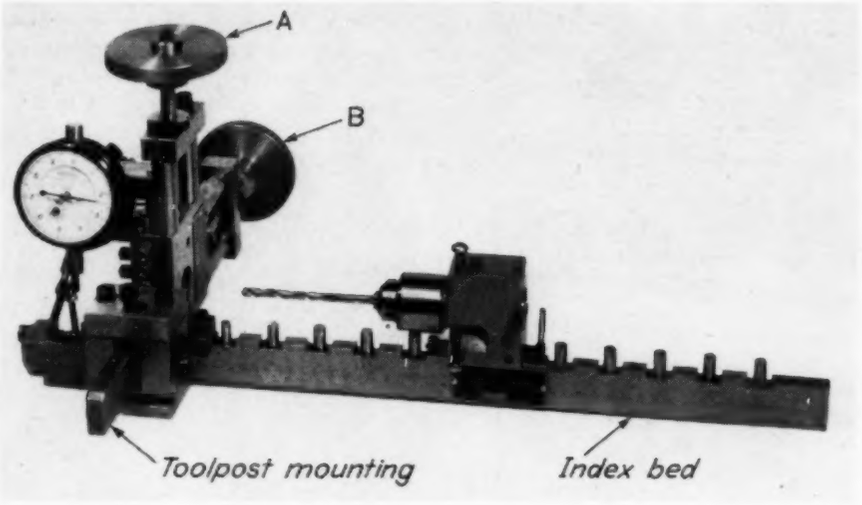


Fig. 1—Model *A* "Turnomat" normally has a length capacity of 12 in. and diameter capacity of 1/32 to ¼ in. for instrument and clock parts. Knob *A* controls straight turning tools; knob *B* controls form tools and undercutting tools

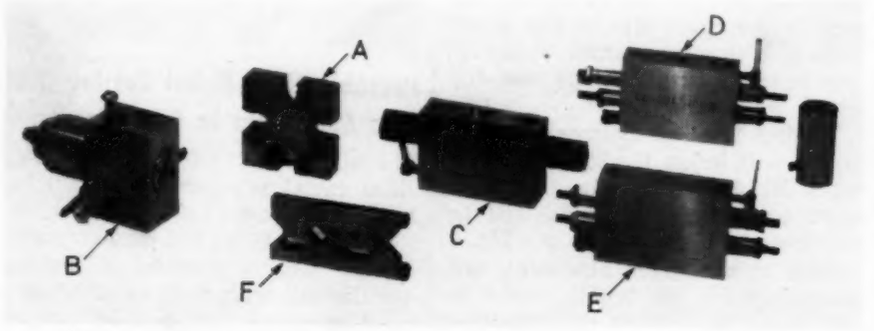


Fig. 2—Fittings for Model *A* Turnomat: *A*—diameter stop block; *B*—combination drill and acorn-die holder; *C*—reamer and drill holder; *D* and *E*—step blocks for boring; *F*—Stock guide for 1/32- to ¼-in. stock

Long, Slender Work Is Step-Turned Economically with Karge "Turnomats"

There is no length limitation for work that can be turned with various diameters, tapers and forms, with the two types of Turnomats developed by Karge & Son Machine Co., Brockport, N. Y. These devices are essentially a self-contained screw machine that is put in the lathe toolpost or fastened onto the compound so the stock can be driven by power. Accuracy of diameter and length of steps, normally ±0.001 in., and to within a few tenths with appropriate care, is independent of the machine to which the Turnomat is applied.

The basic reason for accuracy is that the stock is machined close to the guide bushing or guide plate and because both diameters and lengths are controlled with gage blocks or gaging pins preset with gage blocks.

The Model *A* Turnomat is built for precision work, using stop blocks or gage blocks for initial settings of the tool slides, plus dial indicators to check whether the tool feed is brought to the required dimension within 0.0001 in. Because of this construction, the Model *A* is normally used in instrument, clock and watch-part manufacture. This model is made in one size only to take stock ranging from 1/32 to ¼ in. in diameter by any length.

The index bed, 12 in. or longer, is fitted with numbered precision pins set exactly 1 in. apart. Thus, if the operator must turn a specified diameter to a length of 3 in., he places the stop block (Fig. 2) on the No. 3 pin. The stop block has four settings to give any differential between 2 and 3 in.—that is, ¼, ⅜, ½ and ¾ in. as desired. Stops on the four faces of the block are set with gage blocks.

The diameter stop block, *A*, Fig. 2, has four notches that fit into the special washer below the turning-control handle, *A*, Fig. 1. Adjacent to each notch is a pair of diameter-setting screws preset for height with micrometers or height gages. Each notch with its adjacent screws corresponds to a desired diameter wanted on the work. The 0.0001-in. indicator serves to show the operator that he is exactly on the desired diameter, thus avoiding inaccuracies by various tensions on the control knob.

The Model *A* Turnomat may be operated at the same rate of feed as any automatic lathe or screw machine, but is not limited as to length of workpiece handled. One typical workpiece was 12 in. long and had 7 diameters, plus one end threaded. The maximum diameter was ¼ in., the minimum diameter 1/16 in., yet this workpiece was produced in less than 7 min. for an accuracy of ±0.001 in. and required no further finishing.

The Model *B* Turnomat is a production-type tool and is readily mounted on a compound rest or clamped in a toolholder. Shops are finding it expedient to have a number of these devices constantly set up for diameter and length settings and draw them from the tool crib when production lots of parts are

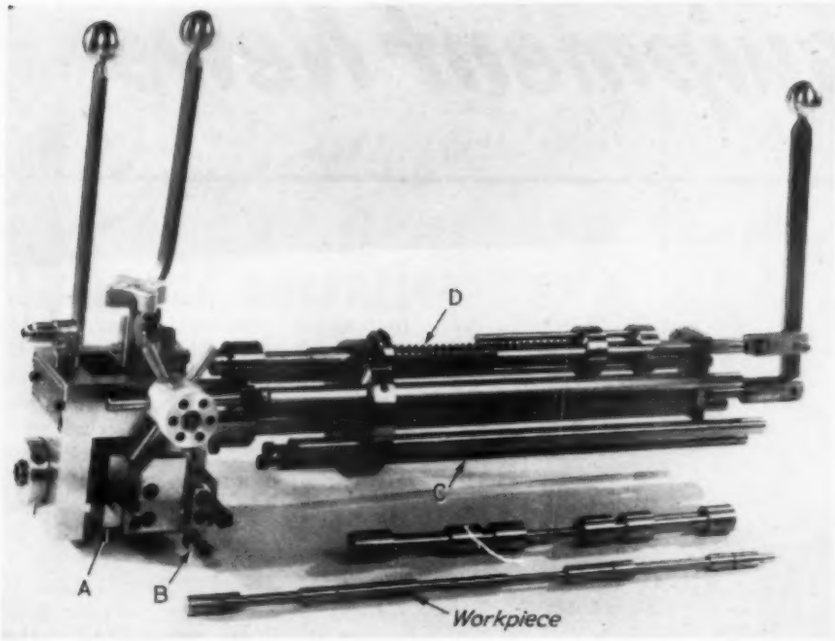


Fig. 3—Model *B* Turnomat (production-type tool) can be put on lathe or other machine in 2 min., will step-turn any length of centerless ground or commercial stock up to 12 ft. long or more

required, to minimize setup time.

Three sizes of the Model *B* are made—B1, capacity 0 to ½ in.; B2, capacity ⅜ to 1 in.; B3, capacity ¾ to 1½ in. These three sizes will take about 90% of the long slender work required by industry. A Model *B* will turn any length of shaft up to lengths of 12 ft. or more.

The stock is fed into a cast-iron guide bushing of the split type to permit adjustment to variations of stock diameter. The whole bushing is contained in a double pre-loaded ball bearing. Tightness of the bushing on the work is correct when it will just cause the bearing to rotate.

Two slides are mounted in the head. Slide *A*, Fig. 3, nearest to the guide bushing, mounts a turning or forming tool in the position toward the operator, and a cutting-off tool at the rear. With the operating handle vertical, the tool slide is in its neutral position.

Slide *B* contains a facing or forming tool at the front, has a center hole to act as a guide bushing, and a third opening for an acorn die.

Lengths of work steps are controlled by the turret at the right end of the device. Five positions as at *C* are used for length control, and a sixth *D* is fitted with an optional drill plunger. Depth of drilling is controlled by four length stops.

Any combination of short or long shoulders can be turned on the work. The five length stops can be set for whatever values are desired, and in addition, extension sleeves may be slipped over them for other lengths.

Diameters are likewise infinite. As shown, the device has a diameter index selector, or turret, that mounts 6 or more gage pins of varying diameters. These pins are turned by the user to the exact size of the work. Also they are numbered to correspond with length stops on the length indexing turret.

To turn the first diameter, the operator will index the diameter turret to No. 1 position, whereupon the anvil on the turning slide will be arrested by the diameter pin No. 1 resting upon a fixed abutment, and he will index the length turret so that Stop No. 1 is in position. The stock is fed through the guide bushing by carriage movement until it hits Stop No. 1 on the length turret. Whereupon the operator withdraws the forming slide, indexes the diameter turret to pin No. 2, returns the slide to cutting position, and indexes the length turret to pin No. 2.

Cutting off with the front slide is controlled by an adjustment screw.

The second slide is used mainly for facing and preparing stock for center drilling and drilling operations. The front of the center drill chuck in the length turret pilots in the clearance hole of slide No. 2 to center drill exactly on center.

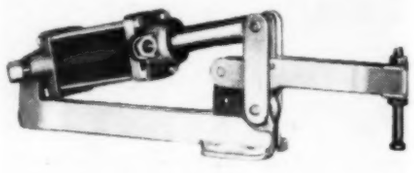
This attachment can be used on any class of lathe from 9 to 24 in. swing, handscrew machines, or semi-automatics of equal capacity. Also it may be used in a drillpress with hollow spindle and automatic feed, or even on a milling machine. The tool weighs 18 lb.

If desired, the Model *B* may be secured with a coolant system consisting of a pump and 1-gal. sump and a chip tray. Coolant high in animal fat is preferred for the class of work done with this attachment.

An accuracy of ± 0.001 in. is nominal with the attachment, or to a few ten-thousands of an inch with care. A burnished finish is produced. Either centerless ground or commercial stock can be used. Even tubing can be properly machined to a high finish. In one case, a piece of tubing 12 in. long was step-turned, leaving only 0.003-in. wall in some sections.

Portable Sheet-Metal Cutting Tool Cuts Metals Up to 0.040 in. Thick

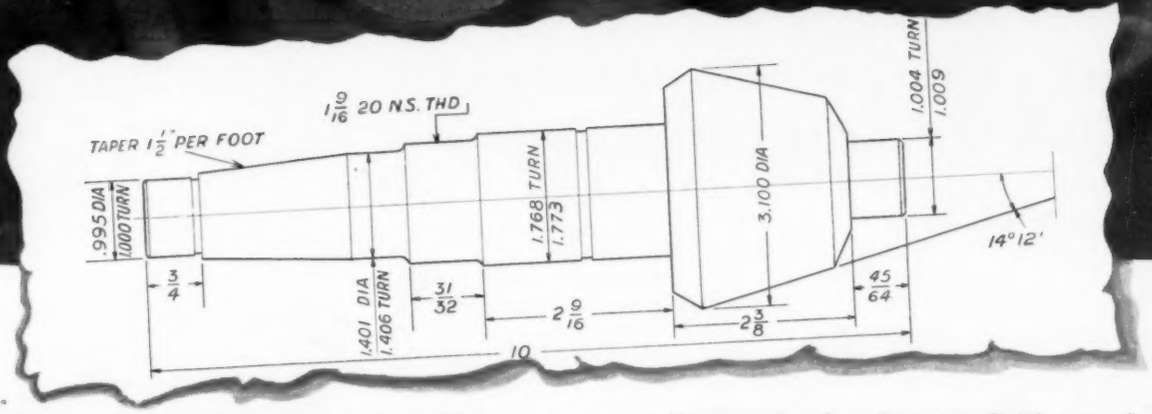
The Nibblex portable cutting tool for sheet metal is offered by Nord International Corp., 130 Greenwich St., New York 6, N. Y. The maneuverable cutting tool is capable of making circular cut with radii as small as 1 in. The small tool can be carried in a pocket and can be fixed in the chuck of any ¼-in. motor in the same manner as a drill. The Nibblex will cut any sheet metal to 1/25 in. thick.



AIR OPERATED CLAMP, listed as AO-400, is offered by Lapeer Mfg. Co., Lapeer, Mich. Maximum clamping pressure is 400 lb. The air-operated double-acting clamp will not release clamped work in case air-pressure accidentally fails. Clamp will remain locked until air pressure is applied

..from rough forgings to finished pinion

with 2 DUOMATICS in 2.2 minutes

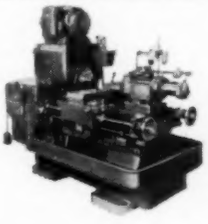


USING two Duomatics as a team is nothing new . . . many manufacturers have even found that one operator can effectively control the two lathes . . . the operator just loads and unloads the work pieces, the Duomatic does the rest!

In the case illustrated above, a noted manufacturer supplying the automotive industry used two Lodge & Shipley 2-A Duomatic (automatic) Lathes to machine a pinion gear forging.

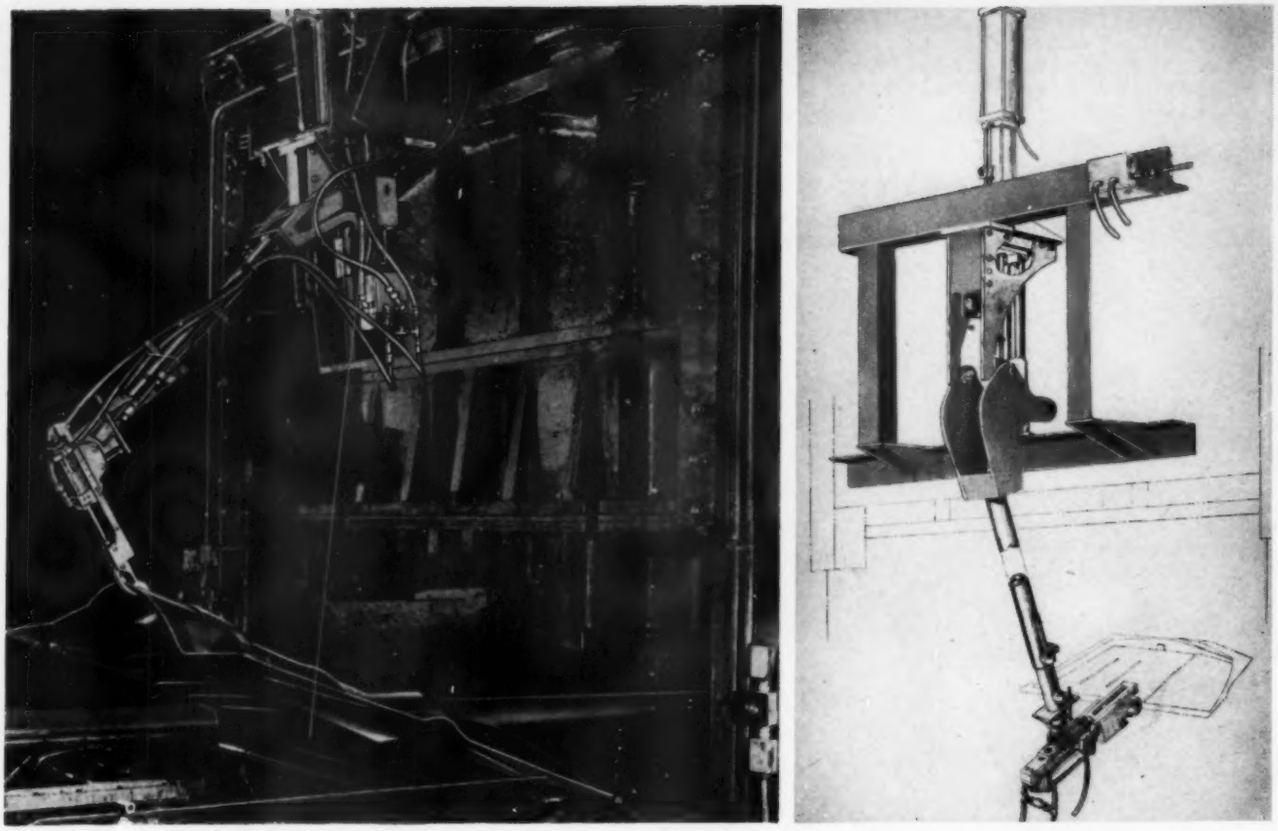
In the first operation (not shown) eight tools, operation on front and back tool carriages, turn for grind taper diameter, bearing diameter, finish turn thread diameter, face, form, neck and fillet. On the second Duomatic, five tools finish taper turn the pinion and straight turn the bearing surfaces, face and form chamfers and fillets. First operation time: 1.3 minutes floor to floor time. Second operation: 0.9 minutes floor to floor time. Total . . . slightly more than two minutes!

Lodge & Shipley Engineers are experienced in setting up production runs of 50 pieces . . . 5000 pieces . . . or more on versatile, rugged Duomatics. They will gladly investigate your production for jobs that can be done better, faster and at lower cost, on a Lodge & Shipley 2-A or 3-A Duomatic. Write for Bulletins No. 634 and 635.



THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO



The Iron Hand automatically removes an automobile floor pan from a draw press

Operating Cycle of Iron-Hand Press Unloader Does Not Depend on Press

The Sahlin Engineering Co., 467 South Woodward Ave., Birmingham, Mich., introduces the Iron Hand press unloader enabling speedy removal of sheet-metal stampings from medium-sized straight-side presses (with a 36-in. bed and about 100-ton capacity) and larger presses. It is recommended as a safety feature as it eliminates handling the stamping as it is removed from the press. Increased production as high as 50% is said to result.

The unloader is self-contained and can be installed on practically all types of presses. The operating cycle does not depend on the press, and the unloader can be timed to remove the panel during any portion of the upstroke. The Iron Hand can be arranged to lift the panel vertically upward for any desired distance before swinging it out, eliminating the need for spring or air liftouts in the lower die. Stampings can be turned over automatically when operation sequence requires it.

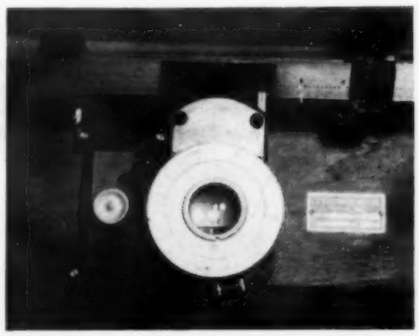
The Iron Hand is adaptable to both the conventional open-type press and the inclosed type. It is portable and can be changed from one press to another.

The ram descends and completes the forming or shearing operation. The jaw of the unloader moves into the die taking hold of the panel the moment the ram is up sufficiently. The panel is lifted out of the die and swung back on to a conveyor or table, after which the Iron Hand is returned to the original position for the next cycle. Distances of liftout and swing are adjustable to different size stampings. Stroke of the jaw is dependent on length of the arm. The length of the arm is telescoped to provide a 24-in. adjustment.

Drum Pump Offers Spider Design Of Piston and Intake Openings

A drum pump for handling heavy greases or light fluids offers a special spider design of the piston and intake opening. This feature provides a cut-through action and large capacity for handling any fluid which seeks its own level, with the exception of lacquer thinners.

Heavy greases are pumped at rates to 3 gpm. Offered by General Scientific Equipment Co., 2700 W. Huntingdon St., Philadelphia 32, Pa., the pump is available in three models. The bung bushing fits both 2- and 1½-in. barrel openings on 15-, 30-, and 60-gal. drums.

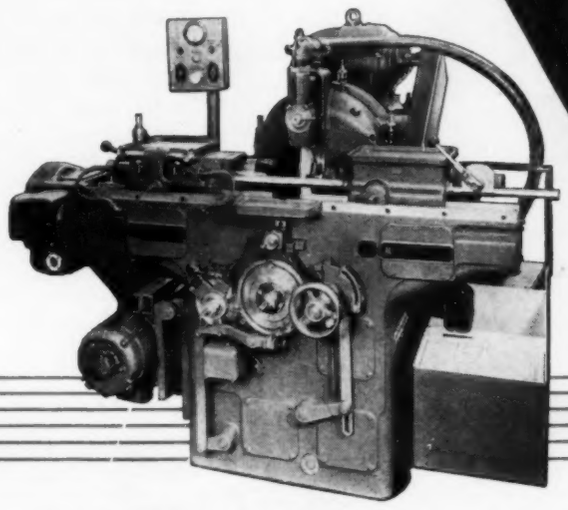


LINEAR MEASURING DEVICE offered by F. T. Griswold Mfg. Co., Lancaster Ave., Wayne, Pa., is called the Scan-a-scale. The Scan-a-scale provides a method of controlling table and spindle movements. It is used in conjunction with a standard reference scale, such as are fitted to many machine tools. The device consists of a microscope fitted with a movable reticle screen controlled by a graduated dial permitting table setting to within 0.0002 in. Graduations are visible at eye distance of approximately 12 in.

110% DIVIDEND

THE FIRST YEAR*

The New Process Gear Corp., Syracuse, N. Y., threads 80 of these drive pinions per hour.



The threads are finish ground from the solid after hardening, on a 6 x 15" Jones & Lamson Automatic Thread Grinder.

110% of the funds invested in this machine returned to the purchaser during its first year of operation.

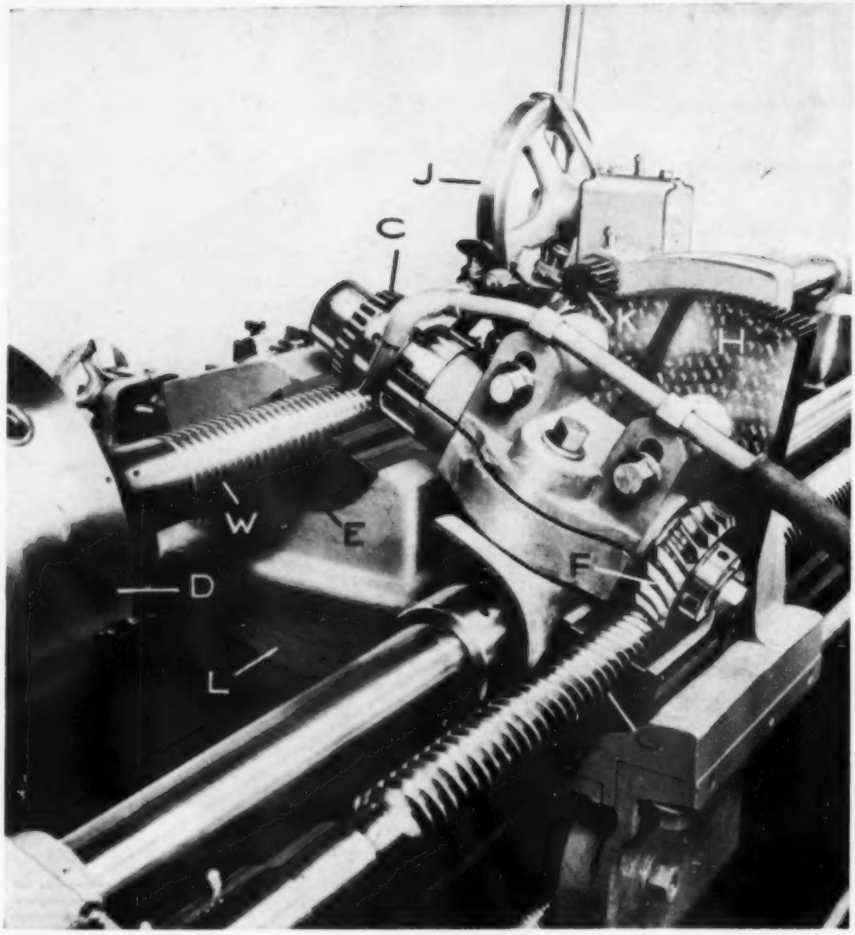
*The piece was completely machined, including the keyway in the thread diameter before hardening. A 6 x 15" J & L Automatic Thread Grinder, using a multi-rib wheel, grinds the thread from the solid, hardened pinion in two revolutions of the work piece, plus the feed-in and lap-over. Scrap was reduced 50%. The savings (based on a daily production of 700 units) in direct labor costs, overhead and gage cost, *paid for machine and equipment in 11 months.*

A survey of your turning, threading and inspection operations by our engineers, might well produce comparable results for you. Write to Dept. 710 G

Thread Grinder Division

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U.S.A.

MACHINE TOOL CRAFTSMEN SINCE 1835

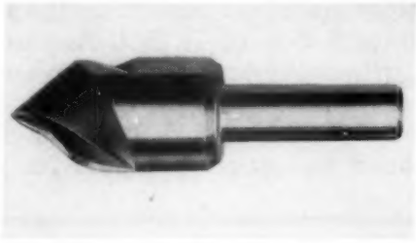


Automatic Thread-Generating Machine Produces Leadscrews, Feed Screws

The George Scherr Co. Inc., New York 12, N. Y., announces the Cornelis thread-generating machine, an automatic machine adapted for the production of machine-tool leadscrews, feed screws, worms and similar items. The bar or worm blank to be threaded is held on one end in a universal self-centering chuck or a special holding fixture.

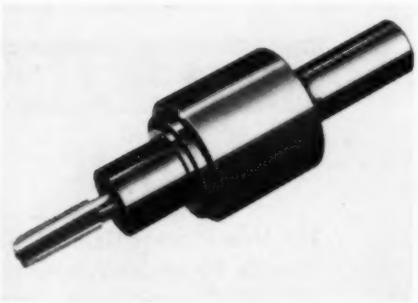
The work is supported in a bushing (E) directly below the cutter. The generating cutter (C) having the helix angle of the work, is driven directly by a bronze worm wheel, (F), meshing with the hardened and ground master leadscrew 30° pressure angle, (G). By driving the cutter directly from the worm wheel in this manner, errors which might otherwise be introduced by change gears, backlash of couplings and other methods are eliminated. Cutters are of high-speed steel.

The control of the depth of cut is by means of a handwheel (J) which is graduated on its rim in 0.001 in. Two types of machines are offered, a plain heavy-duty machine with special heavy saddle and outboard support of cutter spindle, and a universal machine for general production of leadscrews and threads. In each type four different bed lengths are available—18, 37, 77 and 116 in.



Spiral-Fluted Countersinks Designed to Reduce Chatter

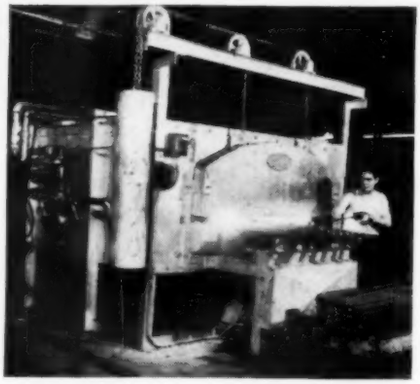
The Aero Tool Co., 6930 Avalon Blvd., Los Angeles 3, Calif., offer a spiral-fluted countersink designed to reduce chatter. The high-speed steel spiral-fluted countersinks offer three spiral flutes. Cutters are available in ⅜, ½ and ⅝ in. in diameter, with ¼-in. shanks and ¾- to 1-in. diameters with a ½-in. shank. Cutters come with these included angles: 60°, 82°, 90°, and 100°, and others.



Floating-Releasing Tap Holder Has Releasing Clutch, Pull-Out

A floating-releasing tap holder is offered by Empire Tool Co., 8774 Grinnell Ave., Detroit 13, Mich. It incorporates a parallel and angular float and a releasing clutch and pull-out. The holder corrects for parallel and angular misalignment but will not bind or freeze under tension or compression, and will float tap out of hole freely. The amount of float is adjustable.

The tap holder is made in 2½-in. sizes to take taps from ½ to 1¼ in. The shank is 1½x4 in.



Spring-Leaf Annealing Furnace Capacities 3600 lb. per Hr.

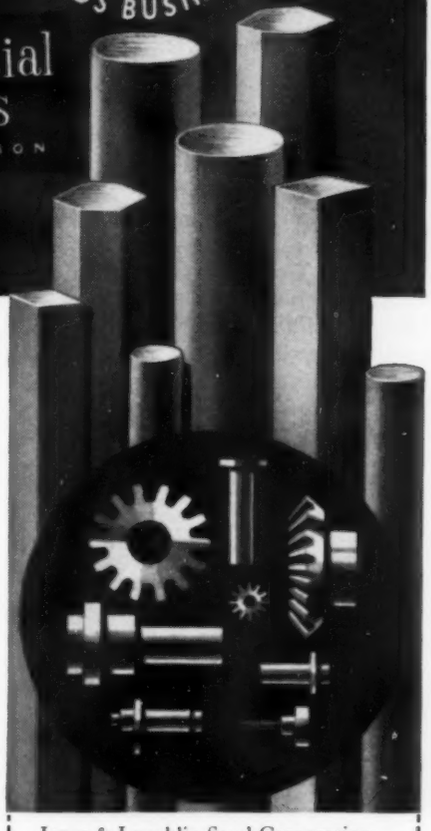
A furnace for the heating of spring leaves prior to forming is offered by Bellevue Industrial Furnace Co., 2971 Bellevue Ave., Detroit 7, Mich. The pusher-type walking-beam alloy rails are driven by a combination mechanical and hydraulic drive.

On top of the walking-beam rails, there are a series of fingers that come up between the springs and push them forward approximately 2½ in. at a time, lowering and returning, and then coming up between the next leaves. This type of conveyor keeps parts located at all times. Maximum production rate is 3600 lb. per hr.

"BRAINS" of the leading Business Machines are made from J & L cold-finished JALCASE STEEL...

J&L STEEL

Monroe
Smith-Corona
National
IBM
Addressograph
CASH REGISTERS • ADDING MACHINES
ACCOUNTING MACHINES
FRIDEN
ALLEN
WALES
SPEEDS THE UNDERWOOD WORLD'S BUSINESS
MARCHANT
R.C. Allen BUSINESS MACHINES
Multigraph
Commercial Controls CORPORATION
Remington Rand



...the original, free-machining, cold-finished open-hearth steel... for better quality precision parts at lower cost.

Look inside a business machine of any leading make, and most likely you'll be looking at a mass of precision parts accurately machined from J&L cold-finished *Jalcase* Steel. To the uninitiated, the "brains" of these modern marvels appear like an insolvable maze, but every tiny gear, lever and cam has a definite job to do—a definite function to perform for rigid accuracy.

There are some sound business reasons why so many of these working parts are made from J&L *Jalcase*—the *original*, free-cutting, open-hearth steel:

- **Jalcase is the leading free-cutting steel—and has been for more than 25 years.**
- **It machines smoothly and easily at high speeds.**
- **It lengthens tool life and reduces the number of stops for re-tooling.**
- **It is easily and quickly heat treated.**
- **It has high wear resistance.**
- **Ten grades plus a number of special treatments offer the Jalcase user a wide range of desirable properties.**

If you machine steel in the manufacture of your products—investigate *Jalcase!*

We have just published a new brochure on cold-finished *Jalcase*, and shall be glad to send a copy to anyone interested in machining rod and bar stock. The coupon at the right is for your convenience.

Jones & Laughlin Steel Corporation
402 Jones & Laughlin Building
Pittsburgh 30, Pennsylvania

Please send me your new brochure describing J&L cold-finished *Jalcase*—the original free-cutting, open-hearth steel.

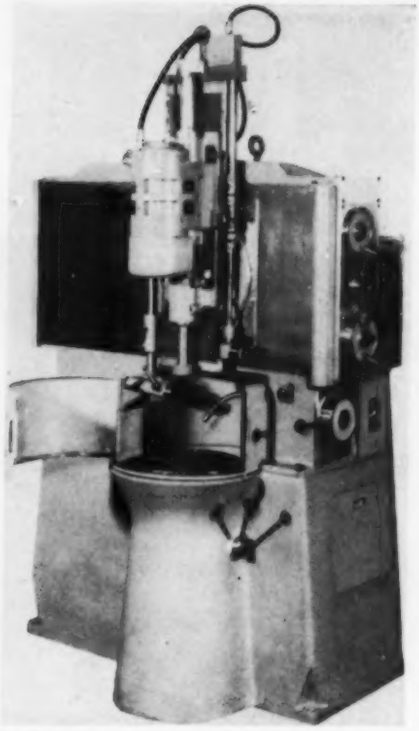
NAME_____

ADDRESS_____

CITY_____ ZONE_____

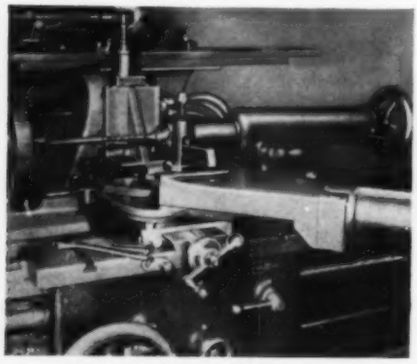
STATE_____

JONES & LAUGHLIN STEEL CORPORATION



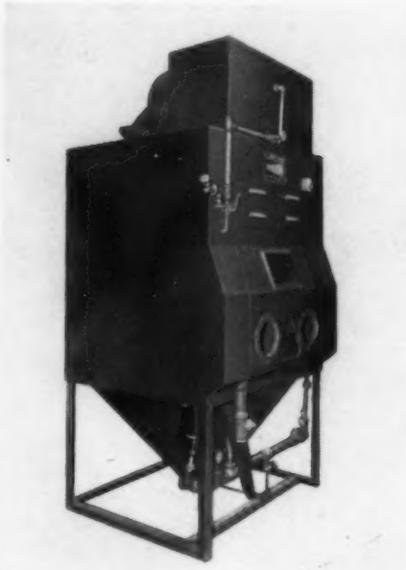
Vertical Universal Grinders Are Hydraulically Operated

The Springfield Machine Tool Co., Springfield, Ohio, offers vertical universal grinders, which are hydraulically operated and offered in two sizes with swing capacities to 32 in. in diameter and nominal grinding capacities of 24 in. in diameter. Work is laid on a solid foundation instead of being suspended. Swiveling wheelhead slide, solid adjustable stops, variable feed, tarry control, and other features are offered.

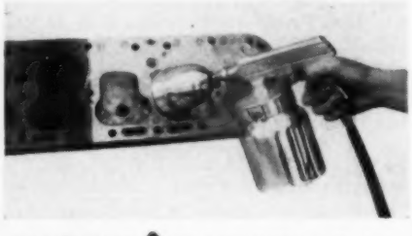


Hydraulic Duplicating Attachments For Boring Mills, Planers, Lathes

Progressively designed one-, two- and three-dimension precision hydraulic duplicating equipment for high-speed production use on all types of boring mills, milling machines, planers, lathes, grinders and special machinery, is offered by Walker Hydraulic Duplicator Co., Standish, Mich., (Box 73). It is said that the equipment is capable of maintaining tolerances of 0.003 in. or less as required. The machine is said to be able to handle large parts such as ore crushers, as well as small die duplicating.



METAL CLEANING AND FINISHING MACHINE, the Jet Blast, for wet abrasive blast cleaning and finishing of metal surfaces, is offered by Armstrong Chemical & Machine Co., Plainesville, Ohio. The machine removes rust scale and undesirable particles by projecting a slurry of fine abrasive suspended in water against the surface to be cleaned. The large permissible variation in abrasive size, 60 to 1250 mesh, makes it possible to produce finishes as low as 2-3 microinches rms. The Model B-4R-A machine has capacity to operate with one to eight blast nozzles



COMBINATION BLAST GUN called the Tornado, is offered by Engineered Products, Inc., 1224 Speer Blvd., Denver, Colorado. The gun is an adaption of sand blasting and solvent spraying. It is air-operated and portable, and is said not to leave buffing marks, grooves or ridges. The gun connects to any air line and is equipped for sand-blast operations or spraying solvents and liquids. Maximum air conception is 9½ cfm. at 100- to 150-lb. pressure

Universal Checking Fixture Checks Tools to 10-in. O.D.

A universal "Sine-Line" checking fixture is announced by Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich. The Model 471-A is offered for checking gears, blanks, hobs, worms, worm blanks, milling cutters, and form tools up to 10-in. O.D. in 8-in. maximum face width.

The various indicator assemblies, available with the machine permit this fixture to be used for checking tooth spacing, pitch radius, concentricity and taper of spur and helical gears, as well as parallelism and crowning of spur gears. The universal fixture can also be used to check flute spacing, radial or off-center sharpening, depth of form, parallelism of straight flute, O.D. eccentricity, and the amount of form relief on the form and milling cutters. Indicators of the two standard and two special assemblies have 0.0005 in. graduations, while the other special indicator assembly, used in checking thread spacing of worms has an indicator with graduations in 0.002 in.

Hy-Pro Multi-Fluted Tap Threads Holes in Plastics

The Hy-Pro Tool Co., New Bedford, Mass., offers a multi-fluted tap for threading holes in all plastic materials. The tap handles hard and soft plastics with either cloth or glass fillers. The design of the tap permits fast chip disposal. Specific modifications and cutting angles have been developed for each type of plastic to be threaded. A special surface treatment assures proper lubrication regardless of material.

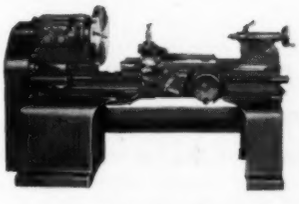
Sebastian GEARED HEAD LATHES

by KING

GENERAL PURPOSE LATHES
Available in
12", 16", and 20" Sizes

12"
GENERAL PURPOSE
LATHE

20"
GENERAL PURPOSE LATHE

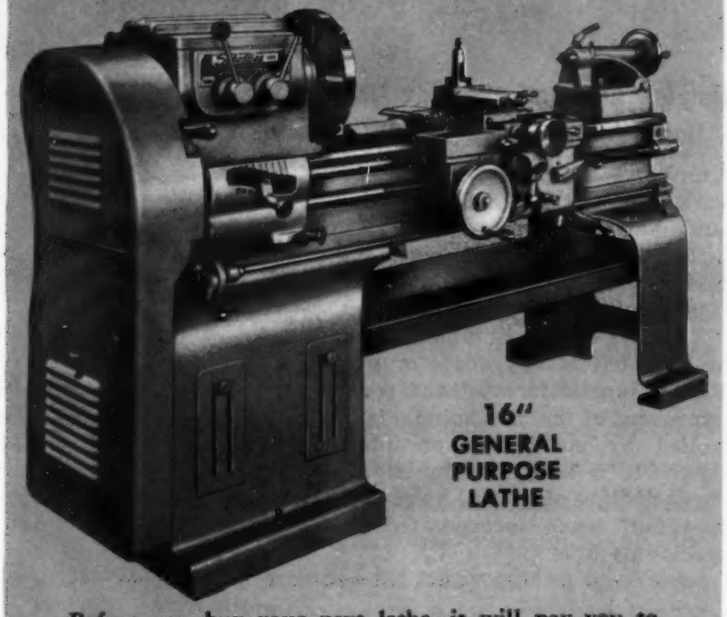


GAP LATHES
Made in 16" and 20" sizes

Also Clutch & Brake, Line Shaft Drive, and other Special Types

All Sebastian Lathes Are Equipped With 8-Speed Geared Head

- **give you a full range of types and sizes to meet your requirements**
- **give you finer lathe construction . . . greater ease of operation . . . longer, more economical service life**



16"
GENERAL
PURPOSE
LATHE

Before you buy your next lathe, it will pay you to investigate the new King-made, medium priced Sebastian. This outstanding lathe incorporates every big-lathe feature contributing to consistent accuracy and time-saving, labor-saving ease of operation. An unusually large number of items are furnished as standard equipment, included in the basic lathe price. And there's the right type of lathe, in the right swing size and bed length, to meet your particular shop requirements. For specifications and construction details, write now for new Catalog S-1 (Standard Type Lathes) and S-101 (Special Type Lathes).

American Steel Foundries

KING MACHINE TOOL DIVISION

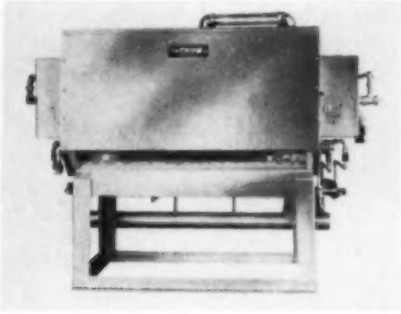
CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

Simplex Automatic Drilling Unit Has Oil Bath for Moving Parts

Simplex Tool Engineering Co., 2540 Park Ave., Detroit 1, Mich., offers an automatic drilling unit, redesigned to include a bath of oil for moving parts. The unit drills holes ranging from No. 5 to 5/16 in. in diameter.

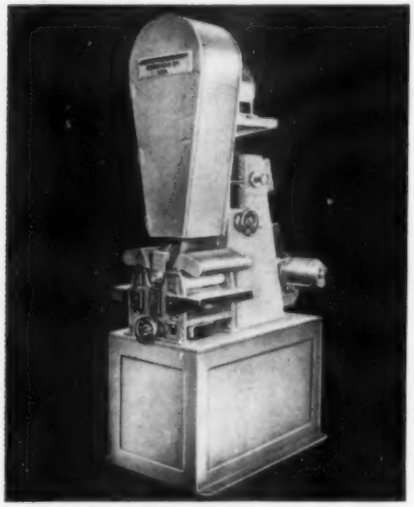
The drill is self-contained and can be mounted at any angle or plane. The automatic forward and reverse movement of the drill spindle is controlled by pushbutton or interval timer. It is adaptable for simultaneous drilling of several holes in one operation when incorporated in a special machine.



Lithium-Atmosphere Forge Furnace Will Heat Forgings Free of Scale

The Lithium Co., 111 Sylvan Ave., Newark 4, N. J., offers a Lithium-atmosphere forge furnace, a direct-fired furnace in which forgings are heated free of scale. A suitable carrier gas from a gas generator is passed through the vaporizer tube where it mixes with vaporized lithium coming from the lithium vaporizing chamber.

The gas fixture is then introduced into the work chamber providing the necessary protective atmosphere. The slight coating of lithium imparted to the metal surface, insures against scaling while metal is being handled. Furnaces are built for heavy constant duty and are available in standard single and double slot and continuous types. The single-slot types run from 12-in. slot width and 8-in. hearth depth, to 64 and 24 in., respectively.

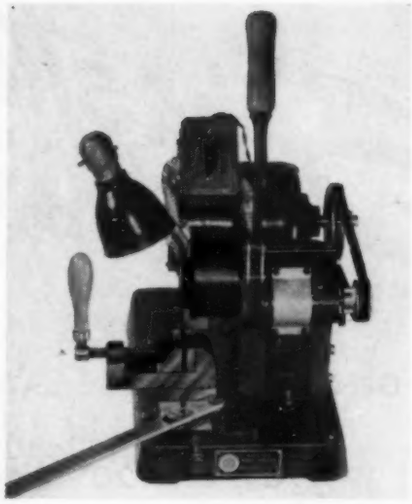


Abrasive-Belt Polisher, Grinder Takes Belt Widths up to 10 in.

The Straight-O-Matic abrasive-belt polisher and grinder, Model 600, is offered by Curtis Machine Corp., Jamestown, N. Y. It allows feeding manually by coil unwinding and winding machines, or by conveyor or equivalent means. Abrasive-belt widths up to 10 in. are available. The infinitely variable feed is adjustable from 20 to 60 fpm. The screw-adjusted feed rolls take stock up to 1 in. thick. The over-all dimensions are 21x42x91¾ in. high. Machine is built in three sub-assemblies: base, sanding unit and feed mechanism.

Flo-Table Steel Belt Conveyor Assembled Using Stock Parts

The Flo-Table stock-model belt conveyor is assembled with stock parts, featuring smooth, pressed-steel precision units. The conveyor is made by Mar-Rail Conveyor Co., 560 York Ave., Pawtucket, R. I. The standardized interchangeable beds offer slide, roller, live roll, or troughing types. Belt widths, 6 to 36 in., in 2-in. multiples are used. Lengths of 100 ft. or more, 10- to 100-lb. per ft. capacity, depending on length and model, are available.



Attachments for Rouse Hand Miller Include Vise, Safety-Cutter Guard

Attachments for the Rouse Hand Miller have been offered by H. B. Rouse & Co., 2214 N. Wayne Ave., Chicago 14, Ill. The No. 7 vise increases the range. It is fitted with a specially slotted removable jaw allowing it to hold odd shaped pieces.

The No. 9 cast-iron safety cutter guard is also offered, eliminating injury to the operator's hands. The No. 9 guard can be drilled for a coolant fitting for conveying the coolant directly to the cutting tool. The hand miller handles light cuts in brass, aluminum, and similar materials.

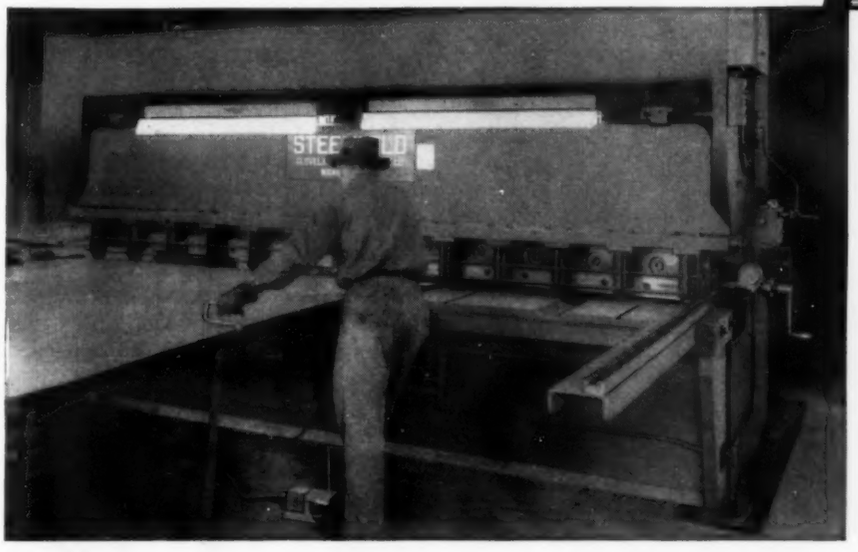
Four Heavy-Duty Kennamatic Tools Offer Square, Cylindrical Inserts

Kennametal, Inc., Latrobe, Pa., offers the Kennamatic heavy-duty tools. Four styles are available, two having square inserts and two having cylindrical inserts of solid Kennametal cemented carbide.

The cylindrical inserts are 1½ in. in diameter by 2¼ in. long, held in 2-in. square or 3-in. square steel shanks. These tools, known as styles 3RK-6RK, are primarily for the machining of cast-iron. The other two styles, 11SK-12SK, are available in two shank sizes—2 in. square having 1x1½-in. square inserts, and a 3-in. square model having 1¼x2-in. square inserts.

TOE CONTROL ELIMINATES KNEE ACTION

ELECTRIC FOOT SWITCH REDUCES FATIGUE - SPEEDS SHEARING



● The operator can slide the switch around the floor to wherever handiest to use. A mere touch of the toe and the knife is set in motion. Electric toe control is standard on all Steelweld Shears and furnished at no extra cost. It enables shearing speeds not attainable with ordinary foot treadles for many cutting operations.

● If you have spent a day at a shear with the old mechanical foot treadle, you know what knee action is. As the hours roll by it grows more and more tiresome, fatiguing, and production slips accordingly.

At last something has been done about it. Electric foot switches have been adopted as standard equipment for Steelweld Shears. Knee action has been replaced by fast easy toe control.

Toe control is one of many outstanding features you get on Steelweld Shears. These machines are in a class by themselves. Learn what they can do for you.

GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

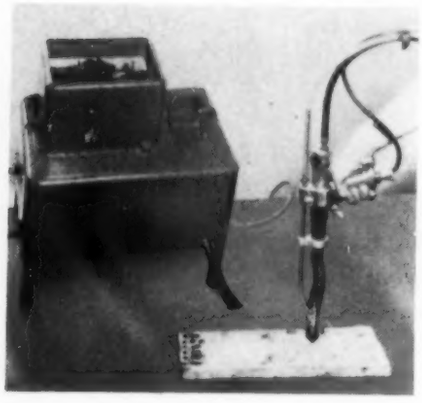
1414 EAST 282ND ST. *WICKLIFFE, OHIO*

STEELWELD PIVOTED BLADE SHEARS

General Electric 3-kw. Preheater For Preheating Plastic Preforms

A 3-kw., 40-megacycle preheater for preheating of plastic preforms has been announced by General Electric's Industrial Heating Division, Schenectady 5, N. Y. The Preheater operates on 230 v., single-phase, 60 cycles, and will heat 40 oz. of wood-flour phenolic compound from 70 F. to 250 F. in one min., or one pound of this material in 24 sec.

An automatic popup cover facilitates preform loading and unloading. Two timers with associated control permit operation alternately with two presses having different load requirements.



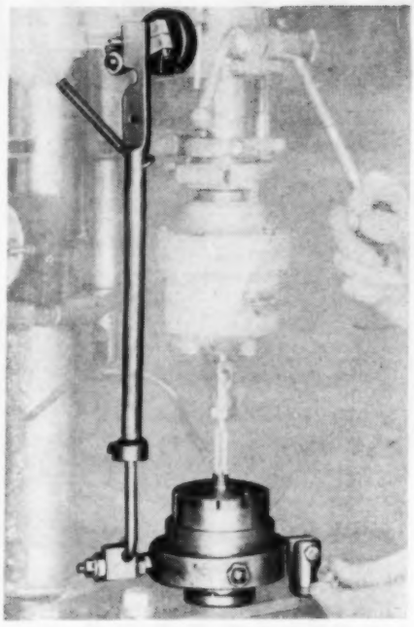
Pneumatic Automatic Screwdriver Feeds from a Hopper to a Driver

A pneumatic, automatic screwdriver is offered by the Reed Prentice Corporation, Dept. 26, 677 Cambridge St., Worcester 4, Mass. The screwdriver has been developed to feed screws, one at a time, from the hopper to the driver. Moving the trigger automatically grips the screw in the driver after it is pneumatically delivered through a tube from the hopper.

A second movement of the trigger gives air pressure to the screwdriver motor for threading the screw into the desired position. Air pressure of 90 lb. is sufficient for both the feed mechanism and the operation of the driver. Models are available to handle any size or type of wood, metal, self-tapping or machine screws.

MOTOR-GENERATOR CHARGER is offered by the Hertner Electric Co., 12690 Elmwood Ave., Cleveland 11, Ohio. The Charg-O-Matic automatic single-circuit motor-generator charger includes an Exide TVR relay and a time-clock switch as standard equipment. This combination gives positive shut down at end of charging period. The time-clock switch on the battery charger can be turned back to zero in the event a battery is taken off the charge and another battery placed on charge before the original timing period is completed

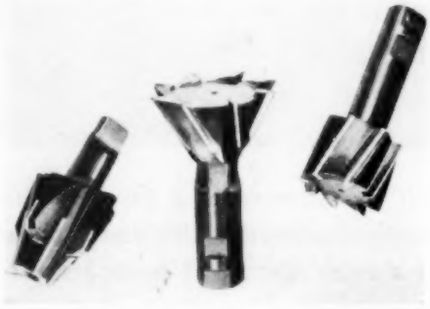
PLANER TOOLS of the square-nose and round-nose type are offered by Kennametal, Inc., Latrobe, Pa. Tools are for planing cast-iron on modern types of planers having a clapper-box lift. Two styles are available, style 15PM is a square-nose tool for finishing where feed per stroke is almost as great as tool width. Style 16PM is a round-nose tool for planing in a trough by plunging and feeding both ways



Collet Chuck Speeds Drillpress Drilling, Tapping Operations

Goodwin Mfg. Co., 10 East Broadway, Cuyahoga Falls 1, Ohio, offers a collet chuck which is said to speed drillpress production drilling and tapping operations.

Mechanical linkage connects the quill to the chuck collar so that the chuck is automatically closed and locked as the tool approaches the workpiece. The chuck uses a multiple-leverage principle and the cantilever action of hardened steel fingers. Chucks are available in sizes having 1- and 2-in. capacities.



Carbide-Tipped Special Reamer Takes Five Cuts in One Pass

U. S. Carbide Tool Co. Inc., 3266 E. 49th St., Cleveland 4, Ohio, offers a special form reamer which takes five cuts in one pass—end, taper, face, chamfer and outside diameter. Also illustrated are a R. H. True-Spiral, R. H. Cut End Mill, right, and an R. H. Spiral R. H. Cut Form-Milling Cutter, middle, used in production milling dovetails on machine parts. Inserts of super-hard, super-tough tungsten carbide are electronically brazed into face of the points.

GOOD!

...from every angle

The New
MONARCH SERIES 60
Long Bed Lathe

Yes, it's good to look at. It's even better to operate—this new Monarch Series 60 Lathe, now available in extra length beds.

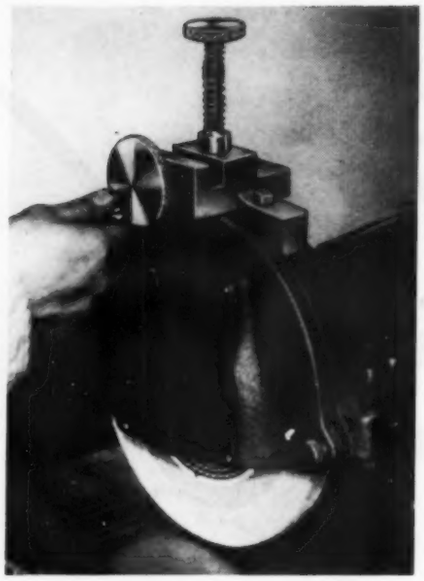
Rigidity—so necessary in turning long jobs—is provided by heavier-than-average triangular bridge-type bed, with up to three heavy, box-type center legs. Accuracy is insured by such exclusive constructional details as the famous Monarch Flame Hardened and ground bedways. Speed of operation—a feature of every Monarch Lathe—is maintained in spite of the most exacting demands.

The Series 60 Long Bed Lathes are available in sizes up to 318″ between centers for the 14″ and 16″ machines, up to 312″ for the 18″ and 20″ machines. Write for descriptive literature.

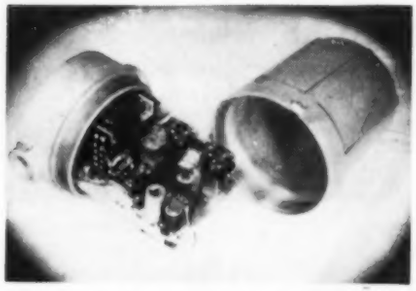
THE MONARCH MACHINE TOOL CO.
Sidney, Ohio

ACCURACY - ECONOMY - LONG LIFE
Monarch
TURNING MACHINES

FOR A GOOD TURN *FASTER*——TURN TO MONARCH



WHEEL DRESSER is made by Matco Tool Co., 2830-36 West Lake St., Chicago 12, Ill., for surface and cylindrical grinders. It is said to eliminate starting and stopping of machine, removing and replacing work on the chuck, lowering and raising wheel head, wheel and diamond accidents and locating diamond for dressing



Electronic Load Control Offered For Pulverizers, Pumps, Extruders

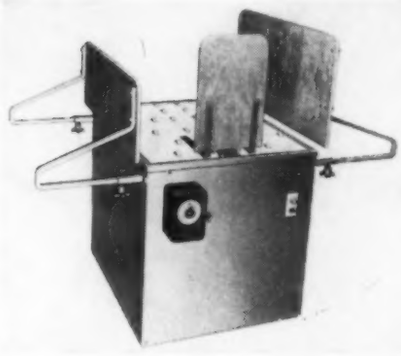
The G. C. Wilson & Co., Chatham, N. J., offers the Flex-I-Trol electronic load control for use with motor-operated processes such as pulverizers, pumps and extruders. Constant motor load is maintained by regulating the input feed. Variable time delays and a variable dead zone are incorporated to eliminate hunting, and to insure operation at maximum output.

Erickson-State Boring, Reaming Tool Incorporates Four Cutters

The Erickson-State boring and reaming tool, formerly the State boring and reaming tool is now manufactured by the Erickson Tool Division, Erickson Steel Co., 2309 Hamilton Ave., Cleveland 14, Ohio. The four-cutter principle permits four feeds and speeds to form jobs within 1 1/16 in. to 5½ in.

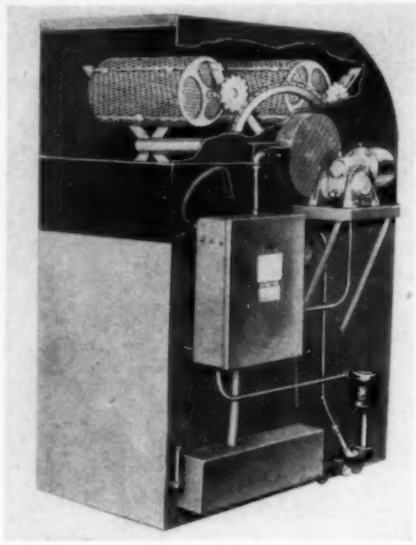
Punch Press Feeding Pliers, Disintegrate Under Impact

A line of aluminum-alloy pliers for feeding stock into punch presses is offered by the Osborn Mfg. Co., 200 Argonne Rd., Warsaw, Ind. Pliers have a tensile strength of 23,000 psi., elasticity of 6.38 and a Brinell of 60. Pliers pulverize if caught in the die. As a result there is no damage to dies and no danger of flying fragments to become imbedded in operator's hands, face or eyes. Six standard designs are available.



Automatic Counter and Stacker Handles 200 Flat Pieces Per Min.

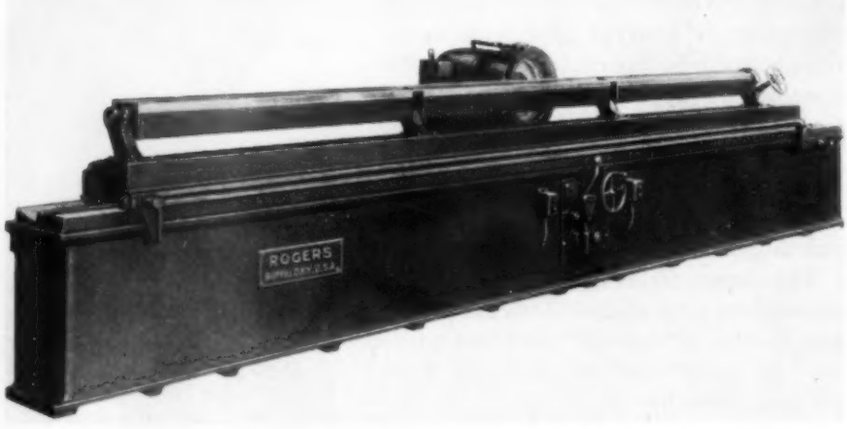
An automatic counter and stacker is offered by the Superior Punch Press Co., 3610 Superior Ave., Cleveland, Ohio. The machine will count objects from a production line up to a speed of 200 pieces per min., stack them in piles, and then transfer the counted stacks to the conveyor system. Each stack is electrically counted, ready for the next operation. The machine will handle pieces 9 to 82 in. wide and will transfer the counted stack in 1/3 sec.



Phillips Tumbling Rotomatic Offers New Vapor Degreaser

Phillips Mfg. Co., 3475 W. Touhy Ave., Chicago 45, Ill., offers a tumbling Rotomatic featuring conveyorized vapor-degreasing equipment. Parts when placed in a basket on the tumbling Rotomatic for degreasing, are tumbled eliminating cupping action and saving solvent.

The tumbling basket makes approximately 9 complete revolutions to every one revolution of the reel. Each basket is fitted with a tubular shaft with a spring stub-shaft carried on one end for loading and unloading.



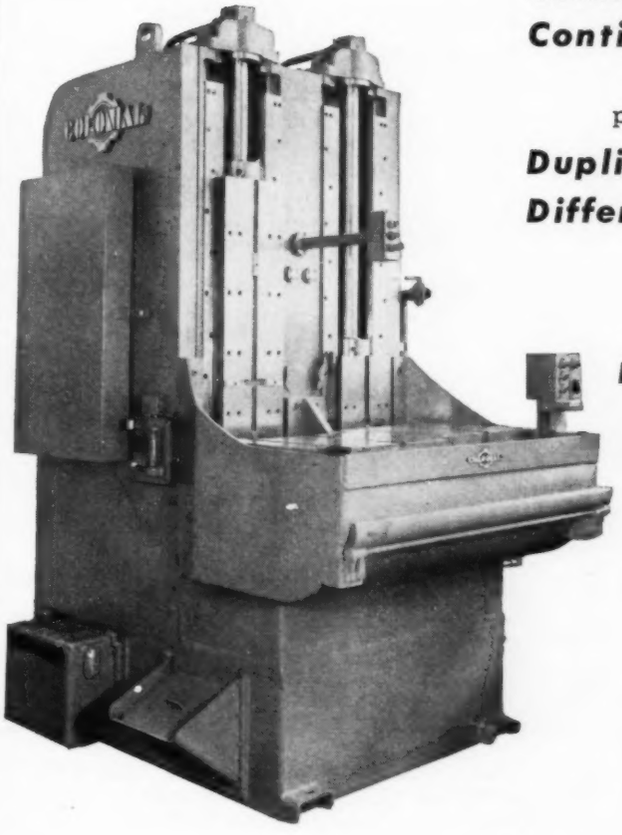
GRINDER handles knives up to 160 in. long. The heavy-duty machine is manufactured by Samuel C. Rogers & Co., 183-205 Dutton Ave., Buffalo 11, N.Y. Listed as Type NT-160, the machine handles chipper knives, paper knives and doctor blades used in the paper industry and printing trades. An extra wide 5-in. V-way on the base and carriage permits heavier grinding pressure and fast feed. Cross feed can be controlled either manually or by automatic control

Another round of wage Raises?

#1 +#2 +#3 + ?

OFFSET THESE COSTS with machines like these—

New COLONIAL DUAL-RAM Surface Broaching Machines



Continuous loading
Continuous cutting

with the rams performing either

Duplicate operations, or
Different operations, on

the same or different parts

Now further improved with

All electric controls

•

Preselective continuous or single cycling

•

Faster set-up

•

Minimum down-time for maintenance

•

Higher capacity

•

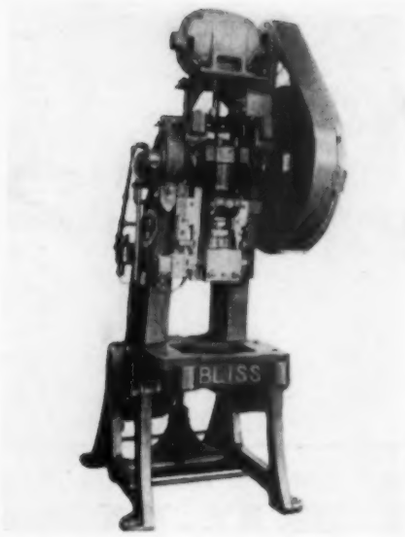
and a host of other operating and structural features.

Ask for Bulletin #RT-48

PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13



Flywheel-Type Inclinable Presses Have Pneumatic Friction Clutch

E. W. Bliss Co., 450 Amsterdam Ave., Detroit 2, Mich., offers the flywheel-type inclinable presses, as well as smaller geared sizes, equipped with the Bliss pneumatic friction clutch and brake. Presses can be stopped at any point in the stroke. The friction clutch is valuable where an inching action is desirable to facilitate setting up certain types of dies. The press may also be reversed allowing the punch to be backed away from the die without completing the stroke when necessary.

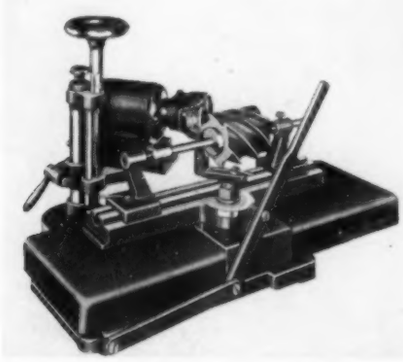
Pistol-Grip Type Electric Drill Comes in Three Sizes, Five Speeds

Milwaukee Electric Tool Corp., Milwaukee, Wis., offers a pistol-grip type electric drill, the Hole-Shooter, available in three different drill-size capacities and five different rated speeds (idle)—⅜ in. at 650 rpm., 5/16 in. at 1000 rpm., and ¼ in. at 2000, 3500, and 5000 rpm.

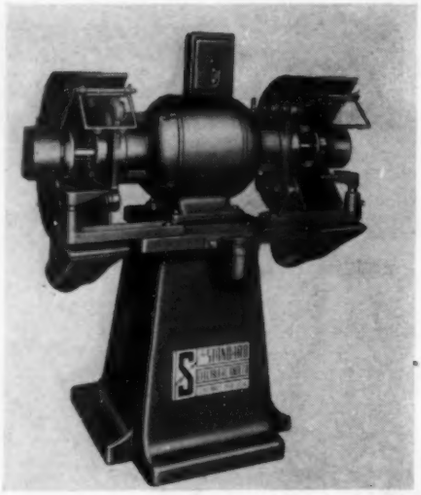
Motor brushes and commutator are accesible without dismantling the drill. Both brushes are removable from the outside. Hole-Shooters are equipped with ac. or dc. universal-type motors for 115-v. current.

Tripod-Type All-Steel Shear Stand Supports Varied Machines, Tools

A tripod-type welded all-steel shear stand has been introduced by Beverly Shear Mfg. Co., Chicago, Ill. Designed to support the Beverly throatless and Beverly slitting shears, the tripod stand is adaptable to many types of machines and tools. The tripod design is said to compensate for uneven or irregular floors. The top mounting plate measures 7x11 in.

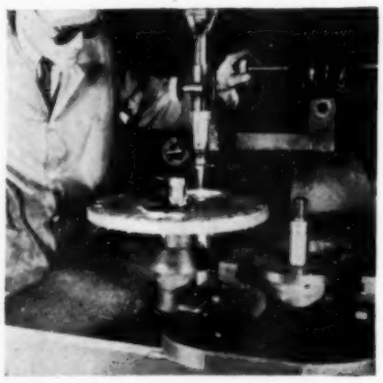


UNIVERSAL CUTTER GRINDER called the Carlco, is manufactured by Carlson Brothers Tool & Engineering Co., 2647 Coyle Ave., Chicago 45, Ill. The machine was formerly the Hilco Universal Cutter Grinder, made by Berco Mfg. Co. of Chicago. The machine features a 9-in. horizontal movement of the carriage and a 6-in. vertical movement of motor. Table (flat bed) cutter capacity is 6-in. O.D., 9-in. face. The table has a 20-in. working surface



Grinder by Standard-Electrical Handles 20x3-in. Grinding Wheels

A heavy-duty grinder, part of the Cadet line, has been announced by the Standard Electrical Tool Co., 2480 W. Sixth St., Cincinnati 4, Ohio. The grinder is a 7½-hp., 20-in. machine, Type 70FAS, with 1150-rpm. motor for 20x3-in. grinding wheels. The guards are of structural-plate steel and are adjustable to wear of the wheel. A pushbutton safety starter having overload protection is incorporated.



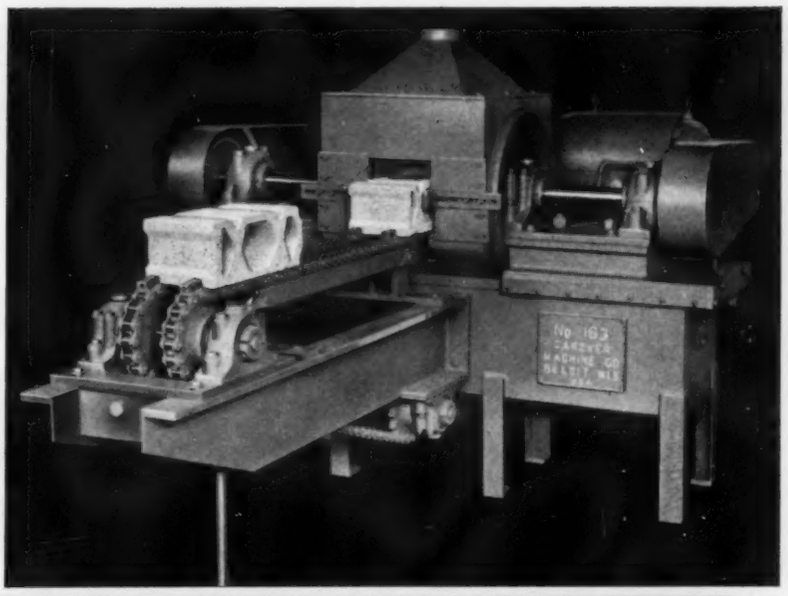
Cogmatic Flame Machining Process Applicable to Sprockets, Gears

The Cogmatic Co., Milwaukee, Wis., offers a flame machining process for cast-iron or cast-steel sprockets and gears. Sprockets are said to be flame machined from steel plate in as little as 5 min. for a 12-in. sprocket.

A pantograph principle is employed, and an oxyacetylene cutting head assembly, mounted on a track is moved forward and backward by mechanical linkage. Movement is transmitted by following one of 20 basic cams, the design of which reflects standard and special sprockets and gears.

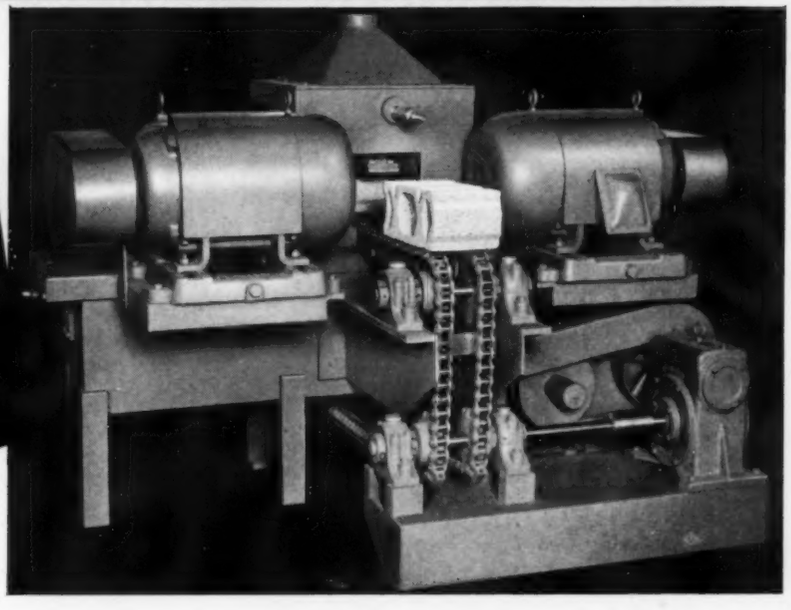
A 1/3-hp. motor has a variable-speed control for even burning, and

LIFT YOUR OUTPUT and LOWER YOUR COSTS on Tough Materials



with

Gardner DOUBLE Grinding!



WORK DATA	
Part	Building Blocks
Material	Concrete
Operation	Grind Two Parallel Ends
Tolerances	Clean up and Hold Commercial Squareness
Stock Removal	⅛" Maximum, Per End
Production	8 Blocks Per Minute
Feed	Hand Load to Chain Conveyor
Machine	No. 163-20" Gardner Double Grinder

GARDNER Double GRINDERS successfully grind an endless variety of parallel-surface products — made of almost every conceivable material. In the example above, TWO ends of concrete blocks are being squared up with ONE pass through the machine. A chain conveyor carries them between two opposed grinding wheels.

If your plant is faced with a difficult flat-surfacing problem, it will pay you to find out how GARDNER Double GRINDING can *raise* your volume of work, and *lower* your production costs.

Write for Latest Bulletin on Gardner DOUBLE Grinding!

GARDNER - GRIND YOUR *Flat* SURFACES

GARDNER MACHINE COMPANY

410 East Gardner Street • • • • Beloit, Wisconsin, U.S.A.

A Multi-Fluted Tap specifically designed to tap in all PLASTIC materials successfully

HERE'S HOW HY-PRO DID IT

PART: Molded Plastic Electronic Control Base.

PROBLEM: Develop a tap, for tapping special plastic electronic control base, that will hold thread size and have an average life of better than 500 pieces per sharpening.

HY-PRO SOLUTION: Hy-Pro Tap Engineers tested the material, then designed a NEW multi-fluted tap to meet specifically the job requirements. Comparative tests with available competitive taps produced these results: 135 pieces per best available tap to 3200 pieces per Hy-Pro Plastics Tap.

Continued experience with leading makers of plastic parts has proved that this design will produce better results than any other tap, in any plastic.

Above is a typical example of how the Hy-Pro Sales Engineer can help increase threaded-hole production. His expert engineering counsel backed by the most up-to-date tap production methods combine to solve tapping problems rapidly and profitably.

All Hy-Pro Taps are ground from tough uniform quality high-speed steel and given one of the Hy-Pro exclusive surface treatments.

Each tap is completely inspected by the latest electronic quality control equipment, your assurance that there will be no dimensional variance in Hy-Pro Taps of a stated size.

These precision manufacturing methods plus the ability of the Hy-Pro Sales Engineer to prescribe the correct tap for your particular job means *sustained accuracy* on your production line resulting in higher productivity from your tapping machines.

Let Hy-Pro solve your tapping problem—call a Hy-Pro Sales Engineer today.

Order from your distributor.

HY-PRO TAPS

HY-PRO TOOL CO.

NEW BEDFORD, MASSACHUSETTS

A SUBSIDIARY OF CONTINENTAL SCREW COMPANY

is used to move all parts. The present model will handle sprockets and gears with diameters to 4 ft.

W-S Injection Molding Machines Have Improved Heating Cylinder

An improved heating cylinder for thermoplastics molding is offered by Watson-Stillman Company, Roselle, N. J. The cylinder is now standard equipment on all W-S Completeline injection-molding machines from 4- to 80-oz. capacity. The design allows capacity shots of such derating materials as polystyrene without stuffing. All surfaces in contact with plastic are chrome-plated.

Wire Control, Straightener Unit Accommodates Any Size of Coil

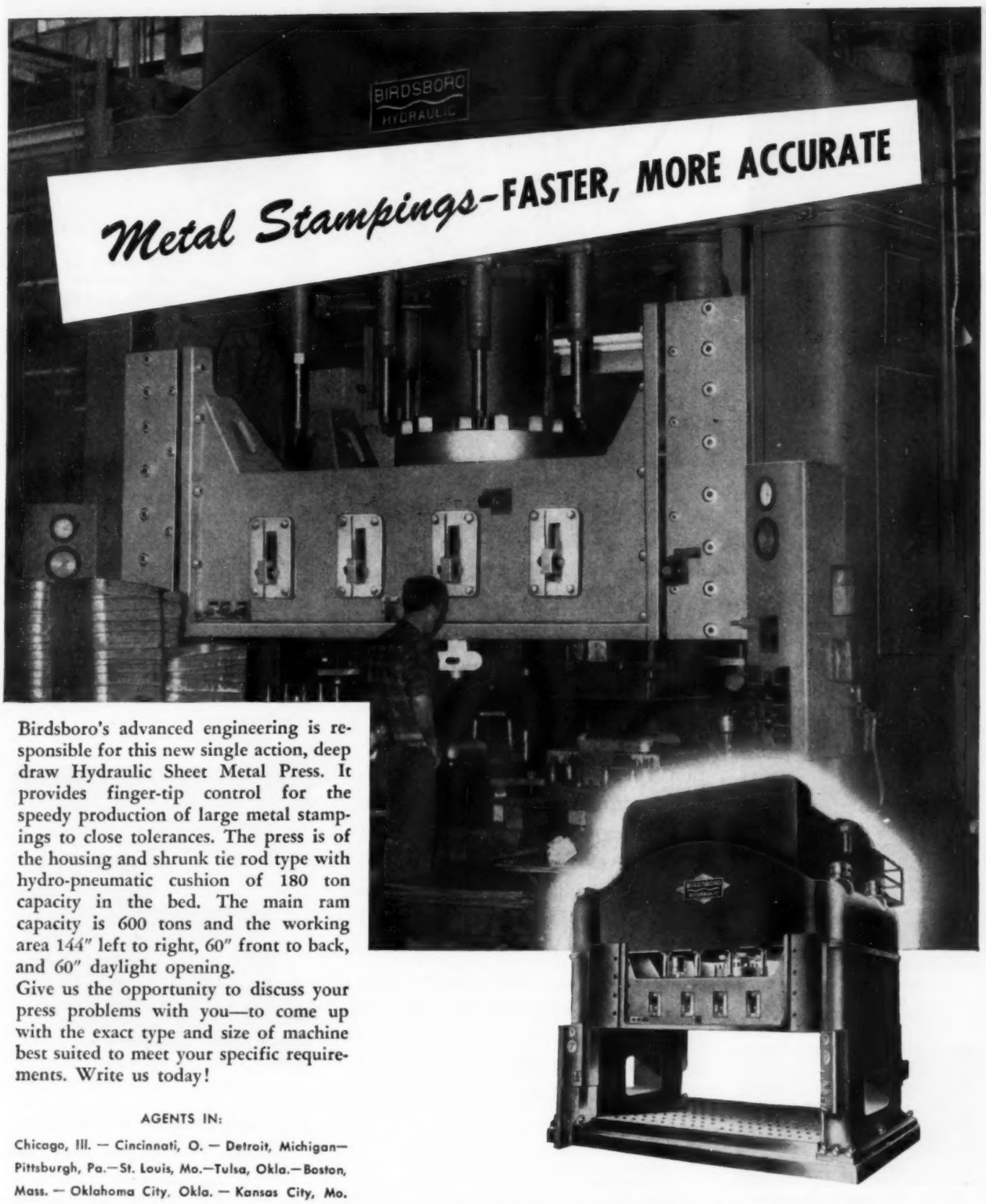
Metallizing Engineering Co. Inc., 38-14—30th St., Long Island City 1, N. Y., offers a wire control and straightening unit, Metco Type 2W. An outer metal hoop keeps the coil on the reel and prevents the wire from riding off or getting tangled under the arms. The machine handles 3/16-in. wire.

PNEUMATIC SAW AND FILE is offered by the Air Speed Tool Co., 1500 West Slauson Ave., Los Angeles 44, Calif. This redesigned tool offers positive shielding from entrance of abrasive elements during hard rough work by using redesigned breather holes. The reciprocating air valve has been replaced by a heavy-duty unit of improved design. A new type of piston leathers, precision fitted to both gun barrels, is used

Ball-Nose Diamond Dresser Offers Sintered Steel Bond

Fish-Schurman Corp., 230 East 45th St., New York 17, N. Y., offers the ball-nose Steelset diamond dresser with an impregnated diamond, sintered-steel bond. The areatype dressing and truing tools eliminate turning and rethreading. Diamond particles retain sharpness throughout life of the dresser.

Metal Stampings—FASTER, MORE ACCURATE



Birdsboro's advanced engineering is responsible for this new single action, deep draw Hydraulic Sheet Metal Press. It provides finger-tip control for the speedy production of large metal stampings to close tolerances. The press is of the housing and shrunk tie rod type with hydro-pneumatic cushion of 180 ton capacity in the bed. The main ram capacity is 600 tons and the working area 144″ left to right, 60″ front to back, and 60″ daylight opening.

Give us the opportunity to discuss your press problems with you—to come up with the exact type and size of machine best suited to meet your specific requirements. Write us today!

AGENTS IN:

Chicago, Ill. — Cincinnati, O. — Detroit, Michigan—Pittsburgh, Pa.—St. Louis, Mo.—Tulsa, Okla.—Boston, Mass. — Oklahoma City, Okla. — Kansas City, Mo.

Birdsboro Steel Foundry & Machine Co. • Birdsboro, Pa.

BIRDSBORO
HYDRAULIC PRESSES

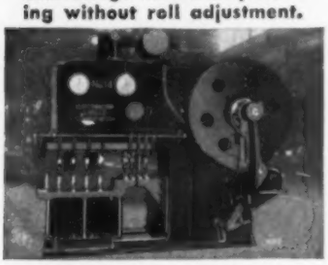
HP-2-48

DESIGNERS and BUILDERS of:

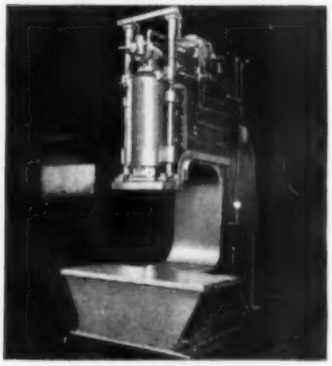
Hydraulic Presses • Steel Mill Equipment • Rolls • Special Machinery • Crushing Machinery • Steel Castings

BEATTY Hydraulic Vertical Bulldozer for heavy forming and pressing.

BEATTY Spacing Table handles flange and web punching without roll adjustment.



BEATTY No. 14 Toggle Beam Punch for structural steel fabrication.



BEATTY 250-Ton Gap Type Press for forming, bending, flanging, pressing.

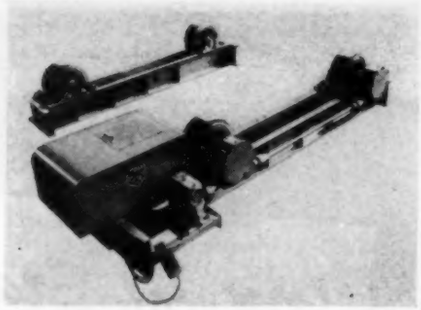
BEATTY Horizontal Hydraulic Bulldozer for heavy forming, flanging, bending.

Obsolete Machines mean OBSOLETE COSTS!

Machines with that "Gay Nineties" look have no place in today's production. Today's high costs of labor, materials, overhead, call for EFFICIENCY —the most modern machine tools that can be developed. And that's our job —to design and build machines to do the job *better, faster* at *lower cost.* If the pressure is on you to build your product for *less,* let us review your machine tools and make recommendations. There's a *better* way to handle most production jobs, and our job is to help you find that *better* way.

HYDRAULIC SHEET METAL WORKING EQUIPMENT

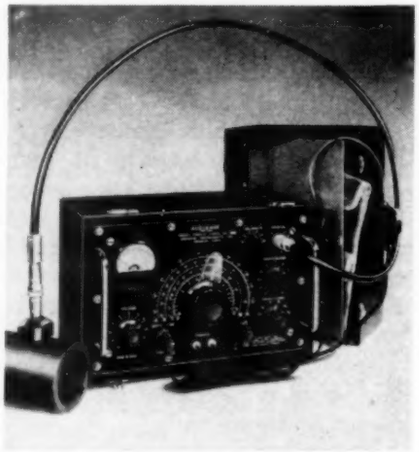
BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA



TURNING ROLLS are made by Ransome Machinery Co., Dunellen, N. J., a subsidiary of Worthington Pump & Machinery Corp. The turning rolls are designed to increase welding production. Anti-friction and self-aligning bearings are offered in the power and idler rolls. Self-propelled turning rolls on 4-wheel carriages are for welding circular and longitudinal seams

Temperature, Pressure Recorders Utilize from One to Four Pens

A line of gas-filled temperature recorders and recording pressure gages is offered by Penn Industrial Instrument Corp., 3116 N. 17th St., Philadelphia 32, Pa. Recorders are available with one, two, three or four pens. Temperature-tube systems feature stainless-steel welded construction with an improved design of the spiral spring.



Thickness Detector Will Measure Metals, Plastics from One Side

The Audigage thickness detector is offered by Branson Instruments, Inc., Danbury, Conn. The model FMSS-5 detector is used for non-destructive thickness measurement of steel, copper, aluminum, glass, unfilled plastics and other materials, from one side. The instrument is portable and battery operated, for field use. Ac. power supply can be furnished if desired. Instrument indications are featured

a Dumore Quill Fills the Bill

when it comes to cutting costs... by saving you time and money on your grinding, drilling, and light milling jobs

Fifteen years of actual tests taught that fact to Chicago Impression Die & Mfg. Co. Mr. R. C. Helfenbein, president, is particularly proud of their use of Dumore quills for milling delicate die work.

They often build a special milling fixture (as shown) for *less than $100.* Yet they can do such accurate work with it that they do not have to finish-grind the job. They are still using the first of many such set-ups after 10 years of service. During that time they used them 16 hours a day, month after month. The only service needed was a bearing change every year or two. No wonder Mr. Helfenbein says his *Dumore quills make the difference between profit and loss on his jobs!*

You, too, can cut your cost with Dumores!

You can do *more* for *less* with Dumore Quills. *You can use them on Dumore Grinders.* They are interchangeable; they adapt one Dumore for dozens of different jobs. *You can use them as work heads in special set-ups.* This helps you avoid buying a costly machine. *You can use them on standard machines* — as replacement spindles, or high-speed work-head attachments.

Plan to use Dumore quills for low-cost grinding, drilling, and light milling. You have a selection of 25 sizes and types. You can work to ±.0001", at speeds up to 42,500 rpm., and to 24" internal grinding depths.

Get the complete story from your Dumore distributor. Let him suggest cost-cutting Dumore set-ups for your shop. Ask him about Dumore Grinders and other tools. Call him today!

Tear out this coupon and mail today!

THE DUMORE COMPANY, Dept. M-14, Racine, Wisconsin M-14

Yes, I'm interested in cutting costs and doing a better job!

Send me information on the items I have checked:

- ☐ Toolpost Grinders
- ☐ Handgrinders
- ☐ Flexible Shaft Tools
- ☐ High-Speed drilling equipment

Name .....

Company ..... Position .....

Address .....

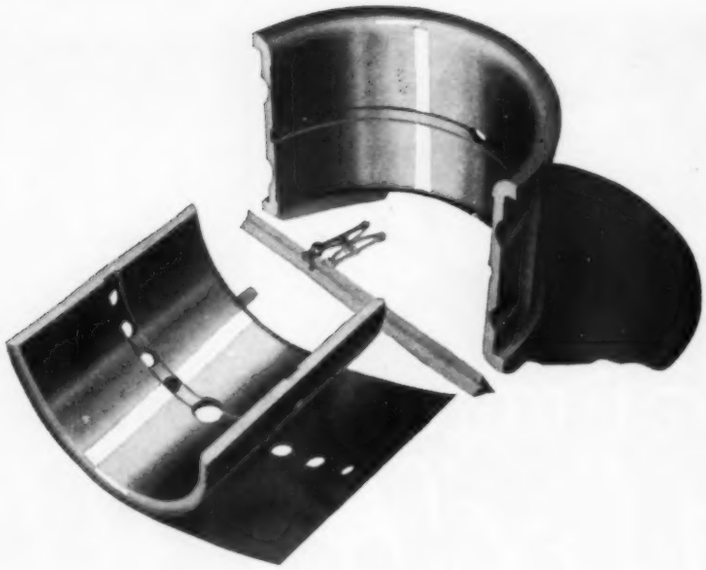
City ..... (. . .) State .....

DUMORE

Reg. U. S. Pat. Off.

RACINE, WISCONSIN

Sold by leading industrial distributors



Babbitt-Lined BEARINGS

Steel or Bronze Back

● Babbitt-lined bearings are ideal for a wide variety of applications. They are "tailor made" in the sense that you have two types of babbitt . . . lead or tin base . . . for the lining and your choice of either bronze—in any alloy—or steel. This permits you to make a selection that will more than meet every operating condition in the most satisfactory manner.

We can help you make the right decision. Simply tell us what you expect of the bearing. Give us the operating speed, load, temperature. Tell us how you will lubricate the bearings; if there is severe pounding or shock; if there is acid or other corrosive conditions to contend with.

We will give you the right answer based on facts . . . and we will prove our statements. Then we will deliver your requirements . . . on time . . . made to precise specifications . . . and guaranteed to be top quality in every respect. Isn't this the type of bearing service you can use at a profit? It costs nothing to find out. Simply call your local Johnson Bronze representative. Why not do it now?

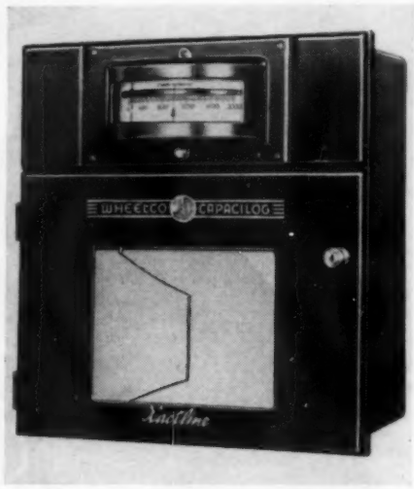
JOHNSON BRONZE CO.
515 S. MILL STREET
NEW CASTLE, PA.

For the **ENGINEER**

Bearing data sheets covering the fundamentals of Sleeve Type Bearings. It's FREE.

JOHNSON BRONZE
SLEEVE BEARING HEADQUARTERS
BRANCHES IN 20 INDUSTRIAL CENTERS

for use in noisy locations. This model offers sensitivity range for measurement of steel down to 1/16 in.



Temperature-Control Instruments Maintain Straight-Line Control

Claud S. Gordon Co., 3000 S. Wallace St., Chicago 16, Ill., offers two straight-line temperature control instruments, the Xactline-Capacitrol and the Xactline-Capacilog, illustrated. Each combines the conventional pyrometer control features with the auxiliary devices for maintaining straight-line temperature control. The two types of instruments are for indicating and recording temperature control.

Universal Milling Attachment Is Driven by Machine Spindle

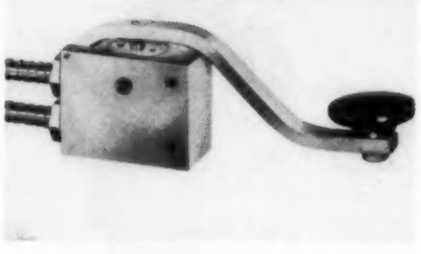
United States Machine Tool Co., Cincinnati 2, Ohio, announces a universal milling attachment, equipped with two heavy-duty steel driving gears and a large idler gear to take the heaviest cuts within the capacity of the milling machine itself, yet operates silently. The attachment

is equipped with a No. 7 B&S taper spindle, and can be used for milling, drilling, or boring at any angle in any plane.

Welded-Edge Hacksaw Blade Is Shatterproof in Design

A high-speed welded-edge hacksaw blade, said to be shatterproof and unbreakable is made by Miller Falls Co., Greenfield, Mass. Called the "Jet-Edge" it is said to allow faster speeds, without blade deflection.

Parts and Materials



THREE-WAY AIR VALVE is made by Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill., Dept. FT-4. Models listed as FT-101 and FC-101 have minimum openings of 5/16-in. throughout. They are of the poppet type and have no sliding closures to wear out. They are fitted with hose nipples to take ⅜-in. I.D. and up to ¾-in. O.D. hose

Pressure Castings Resin Sealant Reduces Losses Due to Porosity

A resin sealant for reducing losses due to porosity in pressure castings is offered by Western Sealant Co., Culver City, Calif. The product is adaptable to two methods of applications, the first called the vacuum-pressure-time-system.

The porous castings are placed in a vacuum-pressure chamber and the atmosphere is lowered to not more than 28.5 in. mercury. At this point the sealant is transferred from the refrigerated reservoir into the chamber until the castings have become immersed. The chamber atmosphere is then neutralized, and pressure from 75 to 250 psi. is created and maintained for time periods up to 30 min. Residue sealant is returned

GRIND RELIEF ON TOOLS

like these

and

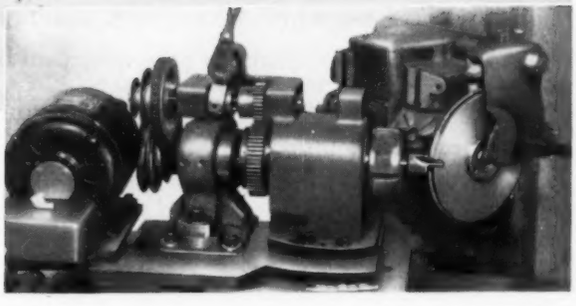
many

others...

FASTER

EASIER

ACCURATELY



THE CIRCULARITY-GRINDING ATTACHMENT is quickly and accurately set up to grind any of the various types of relief on tools such as those shown . . . radial, form, radial and form relief combined. Fits any universal or cutter grinder.

No special cams or fixtures are needed for any setup and no matter what type of relief is being ground, the tool revolves on its own axial center. The amount of relief to be ground is easily adjusted by scales provided on the attachment. All tools ground from a set-up have identical relief produced on them and by recording the scale readings, the same set-up can be made accurately time and time again.

Send for our new illustrated bulletin which gives full particulars on the set-up and operation of the Circularity-Grinding Attachment.

D R & T COMPANY

DETROIT REAMER & TOOL CO.

Mfrs. of Special High Speed Cutting Tools

2830 East 7 Mile Rd. Detroit 12, Michigan

Use AMES Horizontal Indicators

The highly accurate, highly sensitive Ames Horizontal is the right indicator for right-angle readings. It is invaluable for tool room and production jobs where it is advantageous to have the dial in a horizontal plane, and on work surfaces where the use of regular indicators is impractical.

The Ames Horizontal is designed with the usual Ames approach of *sustained accuracy through simplicity.* Action is obtained through a rack and pinion—there are no spirals, cams or levers which might introduce wear and incorrect dial readings. Because of its sturdy, forged brass construction, any surface of the case may be used for mounting—or the regularly supplied holding rod may be used.

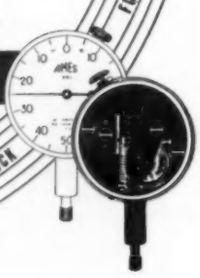
Be sure you're right at right angles, specify Ames Horizontals. Write for new bulletins describing all sizes and models of this modern gauge.

A Universal or Hole Attachment may be clamped to the stem of the Ames Horizontal. It will check holes, stationary or revolving, up to 1¾" deep. This Ames attachment is a favorite for speeding up the performance and accuracy of service and maintenance work.

Address inquiries to Home Office, 26 Ames Street

B. C. AMES CO. *Waltham 54, Mass.*

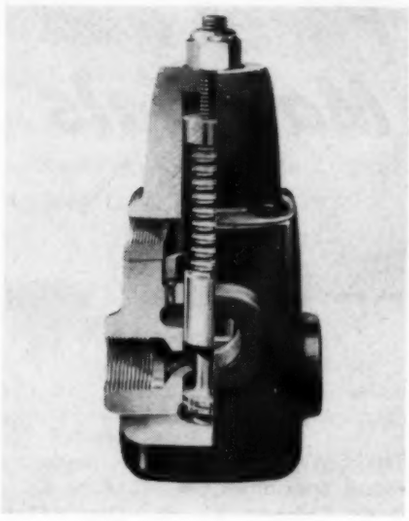
MANUFACTURER OF MICROMETER DIAL GAUGES AND MICROMETER DIAL INDICATORS
Representatives in principal cities



SEMI-PRECISION GRADUATED GRADUATED BEARINGS · FORGED WHEEL SUPPORTS · FORGED BRASS CASE AND STEM · HARDENED STEEL GUIDEPIN AND BLOCK

to the reservoir, the pressure is released, and treated castings are cleansed and placed in a dry heat oven for final curing.

For larger castings such as tanks and pump bushings, all but one design opening in the casting is sealed. The sealant is injected followed by pressures similar to the chamber treatment, and then the remaining sealant is returned to its container and the casting is thoroughly cleaned before being given the dry heat cure. The sealant is said to be resistant to hydrocarbons, petroluem products, salts, water and moderate acid or moderate alkali solutions.

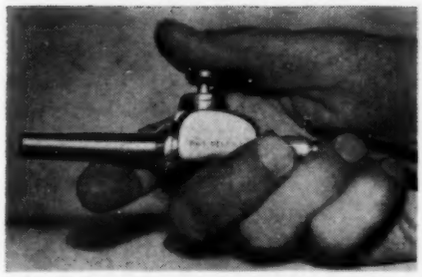


Gerotor May Relief Valve Protects Hydraulic Systems

A chatter-free relief valve is offered by the Gerotor May Corporation, P.O. Box 86, Baltimore 3, Md. The valve protects hydraulic systems against damaging overloads of pressure. A dash-pot feature stops the chatter. Pressure ports permit an in-line piping arrangement. Valve springs are in two sizes or 50-300 and 50-1500 psi.

Hobart No. 90-PL Electrode Offers Low-Hydrogen Coating

Hobart Brothers Co., Hobart Square, Troy, Ohio, offers the Hobart No. 90-PL low-hydrogen electrode designed for welding high-carbon, high-sulphur and other hard-to-weld steels without underbead cracking. The electrode is said to have a smooth and steady arc for good root penetration. Electrode has a tensile strength of 94,000 psi. and is available in 3/32-, ⅛-, 5/32-, 7/32- and ¼-in. diameters for use with dc. welding current only.

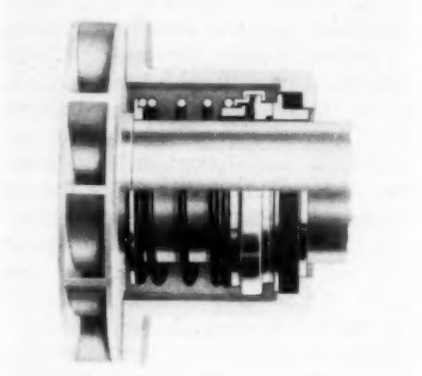


Springless, Packless Air Valve For Any Air Line to 100 psi.

Paul Valve Corporation, 683 Third Ave., New York 17, N. Y., offers a springless, packless air valve for any line up to 100-psi. pressure. The general-purpose air-hose valve is available in ⅛- or ¼-in. hose sizes, both with bodies tapped for standard ¼-in. pipe threads. Nozzle extends approximately 2½ in. The valve is opened by a thumb-actuated plunger that rolls the ball out of the seat and down out of the stream. When the plunger is released, the ball pops back into the seat.

Waterless Cleaner by Schaffner Removes Grease, Dirt from Hands

A waterless cleaner which removes grease, dirt, paint and other substances without irritating the skin of the hands, is offered by Schaffner Industries, Inc., Pittsburgh 2, Pa. Called "Little Doc" Disolvit, lanolin, a soothing substance is contained in the ingredients. Disolvit cleans hands by being rubbed on and wiped off with a dry cloth.



Gits Roto-Flex Shaft Seal For Water and Oil Pumps

A rotating-shaft seal called Roto-Flex has been developed by Gits Brothers Manufacturing Co., Chicago 23, Ill. The seal is suitable for such applications as water and oil pumps, fuel oil and gasoline pumps, speed reducers and other uses. The Roto-Flex has three main compo-

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS.

"Miss Great Lakes" Gold Cup winner for '48

Depended on Wheelock, Lovejoy Alloy Steel

Photo Courtesy The Detroit News

UNUSUALLY ROUGH RACING CONDITIONS DISABLED 12 OUT OF 14 BOATS

Properly selected alloy steel, from which vital equipment was fabricated, played a leading role in winning the grueling 1948 Gold Cup race that saw only 2 of 14 starters cross the finish line. The winner, "MISS GREAT LAKES", driven by Danny Foster and owned by Al Fallon, had underwater struts, rudder, jack shaft and steering pitman arm made from Wheelock, Lovejoy HY-TEN B #3X steel. This particular alloy was selected and properly heat treated to meet the most rugged conditions possible. The fact that not one of these parts failed or even bent, in spite of the terrific beating they took, is ample proof of HY-TEN's superior physicals. And it's proof too that Wheelock, Lovejoy knows steel. Perhaps you have a tough job that demands just the right steel—write Wheelock, Lovejoy today.

WL *steels are metallurgically constant. This guarantees uniformity of chemistry, grain size, hardenability—thus eliminating costly changes in heat treating specifications.*

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.

WHEELOCK, LOVEJOY & CO., INC.

137 Sidney St., Cambridge 39, Mass.

Warehouse Service

CAMBRIDGE · CLEVELAND
CHICAGO · HILLSIDE, N.J.
DETROIT · BUFFALO
CINCINNATI

In Canada

SANDERSON-NEWBOULD, LTD., MONTREAL
AJAX DISTRIBUTING CO., LTD., TORONTO

HY-TEN and AISI

Increased Production plus Greater Safety

with PRESS-RITE PRESSES

PRESS-RITE #3 30 ton Press

No greater combination of features has ever been offered in any punch press that will provide such great safety to the operator . . . dies . . . and press. The PRESS-RITE PRESS line offers this greater safety without added cost and includes such outstanding advantages as

- Built-in Single Stroke Non-Repeat Mechanism
- New patented automatic cam operated brake
- Anti-friction roller bearings in flywheel

Plus large die clearances, frame reinforcements, triple lubrication of ramways, and many other features that assure increased production.

Investigate standard PRESS-RITE 5 ton—10 ton—12 ton—18 ton—and 30 ton Presses *today*.

See your local dealer or write Dept. 268.

Sales Service Machine Tool Co.

PRESS RITE PRESSES · SHAPE RITE SHAPERS · KELLER POWER HACK SAWS

2363 UNIVERSITY AVENUE
ST. PAUL 4, MINNESOTA

When welders can swing tons of weldment into any position for the next downhand pass quickly and safely, with a touch on the push button control, they are able to work better, faster and more economically, no matter what the job. Interruptions in any welding operation are costly—when welders or their helpers must prop up, flop, turn over, crawl under, over and around a weldment, they are adding costs to the job. Because more and more welding is being done in today's production, it is important that your welding costs and quality be examined in the light of economies and improvements made possible by C-F Positioners.

Not only do C-F Positioners give welders more time for welding by permitting them to swing weldments into the correct position for a downhand pass, they make all welding better and more economical by making possible the use of heavier electrodes, eliminate "overwelding" and waste of power and materials. Write for Bulletin WP 24. CULLEN-FRIESTEDT CO., 1313 S. Kilbourn Ave., Chicago 23, Illinois.

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

C-F positioned welds mean better, more economical welds

nents. The rotating member, called the seal nose, is an integral unit and cannot come apart. It is held by a compression spring against the fixed surface or stationary seal.

ROUND TABLE *Discussion*

PROSPECTING

Most men who are laid off receive their pink slips on Friday with their back pay. This amount can carry them only a few days. In starting a new job, the policy is to hold back a week's pay. Therefore, a man who is fortunate to find a new job on Monday "loses" a week's pay. Many lay-offs occur at the end of the month, and the man's pay goes toward the rent, leaving him little for carfare and lunch while looking for a new job. The time necessary to find a new job usually amounts to two weeks. Since most men do not have a layoff reserve fund, they must borrow money to carry them over. It takes a month or two to pay back what was borrowed.

Every man who has gone through this stage promises himself that he will not get caught short again. When rumors of layoffs begin, these men start shopping around to get relocated with the minimum amount of lost pay. If the policy of the company was to give a reasonable notice, these men would wait until they received official notice instead of dashing off on the first hunch or rumor.

The real prospectors are the men who want a different kind of job, better facilities, or more money. They "play the field" while they are employed and have an advantage over the unemployed. They are in a position to bargain with the personnel managers for more money, or pick out the type of work they like to do. An unemployed man is looking for a job—*period*.

When a man leaves unexpectedly, the foreman grabs the first fellow looking for a job because he doesn't want to hold up production waiting for the right man to come along. Many a time I let a good man walk out of the door because there were no vacancies; and a couple of days later because a man left without notice, had to place a mediocre worker because the first applicant was employed in the meantime.

Sometimes it is not the workers' fault that he leaves suddenly. He

might be forced to take the new job immediately. Many a time I had been asked to start work the same day I applied for the job because the new employer threatened that the job would not wait for another week.

Asking the foreman for a day off to look for another job is not only embarrassing but jeopardizes the worker's position. The foreman will handle the employee as a temporary one, or force him to leave by assigning unpleasant tasks. There are not many broadminded foremen in the world, or else they wouldn't be foremen.

Frank J. Zarnowski
Rutherford, N. J.

•

In former days, about all that a man was looking for was a place in which to work, regardless of the conditions surrounding him. He had a family to support, and a good job was the mainstay of their existence. He took many a snub and slur from a foreman, if he had to.

Today, this is far different: men know better how to apply for a position. The best men are, today, discriminating. They look for the best plants where employment conditions are the best. Bennett may think he can improve his outlook by making a change. Among other reasons, he may consider his wages to be too low; he might have some feeling against Ed; perhaps his working companions are not agreeable to him; he may be spending too much time going from home to shop and vice versa.

There have been cases where men have entered shops and have started to work but their stays have been short because they didn't fit in.

Some employers never consider the feelings of their employees. In one case, several men left their employ within a month because the firm placed lower-wattage light bulbs around their machines. This was inhuman because of the lack of sufficient lighting.

A number of years ago a man whose name actually was Bennett applied for a job with a firm where about 200 men were employed.

Now, firms with as few employees as this, seldom have a personnel department, so the superintendent or the foremen do the hiring, but they were always getting good men because they always paid well.

In conversation, B. stated that he had held 29 jobs in 11 years and had never been fired from any of them. He said he was ready to settle down and had selected this shop because of the reputed good working

Press Die Feeding Offers Tremendous Savings Over Hand Feeding

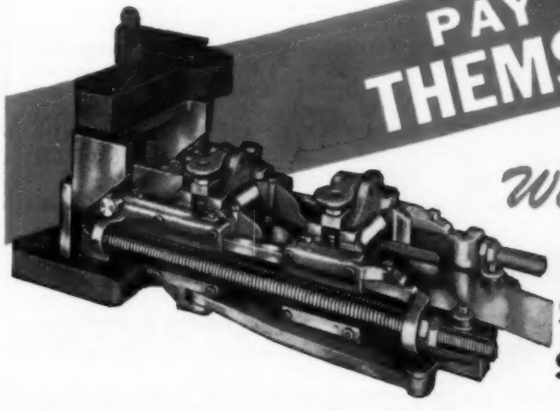
The versatile new automatic die feeds produced by Dickerman are helping speed production in modernized shops across the nation as they take over all hand operations. They are tough and rugged with no wearing parts to get out of order. They are flexible enough to feed stock from any angle, while their extreme accuracy and dependability increase die life by eliminating costly jams and crack-ups.

Dickerman automatic die feeds reduce operator hours 80% to 90% and increase production over 300% over old hand feeding methods. The safety factor of keeping operators' hands out of the danger zone is another worthwhile consideration in the busy shop.

Dickerman Die Feeds

PAY FOR THEMSELVES

in 21.2 Working Days



WITH SAVINGS OF $20. DAILY!

Basing an operator's time at $1.25 per hour, the average hand feeder can produce a maximum of 2,000 pieces per hour, or only 16,000 pieces per day at a labor cost of $10 for 16,000 units. The same press equipped with automatic die feeds and running at 123 RPM on a basis of 83% efficiency will produce 48,000 pieces in the same period . . . an actual saving of $20 per day.

Figuring on this very conservative basis, Dickerman Die Feeds will pay for themselves, out of labor alone, as follows . . . 2" Hitch Feed, 2 days . . . 4" Hitch Feed, 7 days . . . 3" Die Feed in 14 days . . . 6"x 4" Die Feed in 21.2 days and a 6"x 6" Die Feed in 26.2 days. Equally important is the fact that these die feeds can operate for long periods unattended, thereby saving operator's time for other duties.

Write for CATALOG NOW!

H. E. DICKERMAN MFG. CO.
319-1213 Albany St. — Springfield, Mass.

DICKERMAN DISTRIBUTORS

W. C. Chapman & Son
Baltimore, Md.
Saratoga 5703

Fidelity Tool & Supply
Camden, N. J. Camden 4-7765
Phila., Pa. Lombard 3-4482

Federal Machinery Sales Co.
Chicago, Ill.
Central 6680

The Die Supply Co.
Cleveland, Ohio; Dayton, Ohio
UT 1-0550 Adams 6011

Diemaker Supplies, Inc.
Detroit, Mich.
Trinity 1-2865

The Standard Die Supply, Inc.
Indianapolis, Ind.
Riley 5824

Jamison Steel Corp.
Los Angeles, Calif.
Trinity 9826

The Satterlee Co.
Minneapolis, Minn.
Atlantic 5264

Export Department
401 Broadway, New York, N. Y.
Cable Address UNIONTEX

T. E. Ryder Machinery Co.
15 Moliere St., W.
Montreal, Canada

Acme-Danneman Co., Inc.
New York, N. Y.
Canal 6-1759

Colcord-Wright Machinery & Supply Co.
St. Louis, Mo. Central 6970

Lindco, Inc.
Worcester 3, Mass.
6-4637

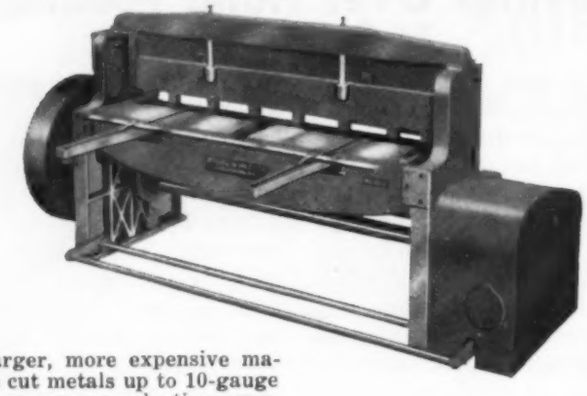
Jamison Steel Corp.
San Francisco, Calif.
Exbrook 2-2230

A. R. Williams Machinery Co., Ltd.
Toronto, Canada
Elgin 2381

R. C. Neal Co., Inc.
Buffalo, N. Y. Cleveland 1110
Offices—Rochester, Elmira, Syracuse

SPEED PRODUCTION, CUT OVERHEAD

with Wysong and Miles Power Squaring Shears



Using larger, more expensive machines to cut metals up to 10-gauge adds unnecessary production overheads. The Wysong and Miles 10 Gauge Shears, 6 foot and 8 foot in width, can do much of the work you are now routing to larger machines.

That's one reason the Wysong and Miles 10 Gauge squaring shears are ideal auxiliary machines. Relatively inexpensive, in both initial investment and operating costs, they are precision machines with an accent on accuracy and speed.

An important feature is the compensating holddown, with a spring actuated plunger in each foot. Even small strips are clamped firmly without adjustment.

The ball-bearing back gauge is set by a handwheel dial reading, adjustable to .0078 (1/128th) of an inch. Taper shearing is easily accomplished.

Another feature is the smoothly operating jaw-type clutch, with all wearing parts accurately machined from tool steel and hardened. For safety and convenience, a non-repeat unit can be set to stop shearing action after each stroke.

Take time now to write for full information about the complete Wysong and Miles line of power squaring shears and other sheet metal machines. **WYSONG AND MILES COMPANY, 623 FULTON STREET, GREENSBORO, NORTH CAROLINA.**

Compound blanking and piercing die . . . machined to tolerances of ± 0.001" in "HSC 265" air hardening alloy steel . . . preferred for its superior wearing qualities, its unusual resistance to warping and distortion in heat treating.

An unusual assortment of fine tool steels . . . in various sizes, shapes, finishes, conditions . . . available promptly from the conveniently located warehouses of Hoyland Steel Company. Complete technical assistance in solving tool steel problems. Hoyland Steel Catalog-Work Book available on request.

DISTRIBUTORS

HOYLAND STEEL COMPANY, INC., 405 Lexington Ave., New York 17, N. Y. • GRAMMER, DEMPSEY & HUDSON, INC., 212 Rome Street, Newark 5, N. J. • ACHORN STEEL COMPANY, 381 Congress Street, Boston 10, Mass. • GREAT WESTERN STEEL CO. INC., 1011 East 61 Street, Los Angeles 1, Cal. • PASSAIC COUNTY STEEL SERVICE, INC., 21 North First Street, Paterson 2, N. J. • THE BRIDGEPORT STEEL COMPANY, P.O. Box 3357, Bridgeport, Conn.

conditions and that the wages were above the average.

When asked what he meant by good conditions, he said he understood that they had rooms to dress in which had lockers, good washing facilities and a room where men could eat their lunches and have a smoke, and there were other points of good treatment which he liked.

He got a job and stayed with this firm until illness and death overtook him 16 years later. When he died, he was assistant superintendent.

After considering these various cases, it seems best for Ed to get together with Bennett and discuss the problem in a reasonable, quiet way. Here Ed's diplomacy will prove to be either A-1 or no good.

F. H. Stebbins

Worcester, N. Y.

•

In my younger days, I was guilty of taking a day off a number of times without informing my boss. Of course, I was looking for another job and felt like a culprit.

I have worked for foremen in whom I could confide even to the extent of asking their advice on a job I was seeking. I have also worked for foremen who advise up-and-coming youngsters to take an outside job when there was no opportunity for advancement where they were.

On the other hand, I have known many foremen who, if they even had suspected you had been looking for another job, would seize the first excuse to lay you off, and thus beat you to the punch.

I don't feel that a man is honor-bound to say he is looking for a change, any more than a boss is honor-bound to inform a man that he is looking for a machine or a man to replace him.

Of course, if a workman is doing an exceptionally urgent job and decides to take the day off to look for another job, I feel that it is only his duty to explain his action. Often the foreman will be so busy at the beginning of the day that he will fail to notice the absence of the man for a time, resulting in further complications on an already rush job. If he is a good foreman, he will, of course, have someone else available to take over the urgent job and thus not jeopardize the situation.

In this discussion, Ed says that a man shouldn't complain if he took the day off to go job hunting and then was laid off when he returned. I disagree. That kind of decision is grossly unfair and in the long run would hurt the employer as well as

the foreman in the eyes of all the men.

A workman has only his labor to sell and like the employer, who has to find the best market for his products, so must the workman find the best market for his labor.

Arthur Silvester
Niantic, Conn.

•

"GOOD MORNING TO YOU"

Whoever heard of a smile's hurting anyone? On the contrary, how often have our spirits been lifted when we saw a smile on someone's face?

Al is right in offering a cheery greeting to fellow workers. Somehow it seems to lighten the labor of the day's work, even though he may have started with a depressed feeling.

Just as courtesy costs nothing but brings indefinable returns, so a pleasant greeting goes far to put a person in a happier frame of mind.

Of course, it is not to be expected that one be a grinning skeleton throughout the day, but a bright smile occasionally relieves the tedium and makes the world not so bad a place.

It would certainly improve Ed's disposition if he adopted the practice.

Milton E. Sussman
Brooklyn, N. Y.

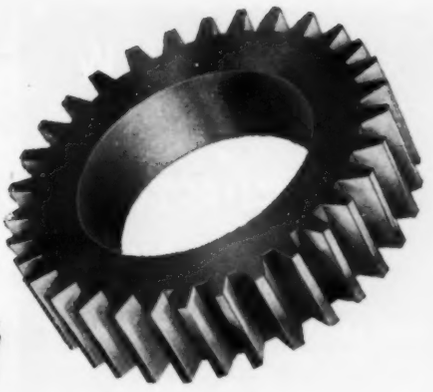
•

Whenever good sportsmen go into conflict, they shake hands before starting to show that, no matter what may come, they will be clean, fair and fight to the best of their abilities.

Just as sportsmen greet each other to show that a fair battle is forthcoming, so should management greet labor mornings with a cheerful "Good Morning to you" to show that no matter how things turn out during the day, management will give labor every break according to abilities. In turn, labor should answer management with the same cheerful "Good Morning" to show that they will give their all during that day.

In the past, management was all-powerful and when the executive spoke everyone trembled. This is true in the old countries where a worker must obey old customs that were handed down for generations. Modern working procedures treat every worker on the same level; there is no class distinction.

World War II showed that a worker is a human being and the amount of work gotten from the individual depends upon how he is treated. When to start the good feeling? Since



contact
PERKINS
first for custom-cut
GEARS

We have manufactured precision gears to customers' specifications for nearly 30 years. Our production equipment comprises modern machine tools and our facilities are ample to meet all demands for the mass production and prompt delivery of such gears.

Our engineers will be glad to work with you on any problems you may have pertaining to gear design. Recommendations as to proper design for *LOWER COSTS*—cheerfully given. Once your specifications are in our files, reorders are filled automatically. *LET US QUOTE ON YOUR REQUIREMENTS NOW!*

YOU FURNISH THE SPECIFICATIONS • WE'LL PRODUCE THE GEARS

PERKINS MACHINE & GEAR Co., Springfield 2, Mass.

PERKINS MAKES in all materials, metallic & non-metallic:

Helical Gears, Bevel Gears, Ratchets, Worm Gears, Spiral Gears, Ground Thread Worms

Our extensive facilities and modern machine tools are also adaptable to the manufacture of all kinds of various parts other than gears, such as the following:

SPROCKETS · SPLINED SHAFTS · SCREW MACHINE PARTS
up to 2¼" in diameter.

We are also exceptionally well equipped to build, to your specifications, such mechanical units as—

PUMPS · SPEED REDUCERS & COMPLETE MACHINES

either in experimental or production quantities. Our well-known reputation is your guarantee of satisfaction. Let us quote on your requirements.

COMPLETELY **NEW**
CASE HARDENING PROCESS

Carburit

ULTRA RAPID PACK HARDENING PASTE

HIGH RAPIDITY OF PENETRATION
.040" in 25 to 30 Minutes

SOLVES PROBLEM OF SELECTIVE HARDENING
by applying only to desired sections

NO SPECIAL FURNACES OR EQUIPMENT NEEDED
—even an open fire will suffice

ENORMOUS TIME SAVING
— repair units can be hardened right in maintenance shop. No special training required

CARBURIT IS NON-TOXIC

Isopac

ISOLATING PASTE

KEEPS DESIRED SECTIONS SOFT

While rest of workpiece is being hardened

REPLACES COPPER PLATING—
and other expensive methods.

JUST PUT ON AND KNOCK OFF
Saves time, money.

PREVENTS PENETRATION OF CARBON AND SLOWS DOWN COOLING OF COVERED SECTION.

NO SHRINKING OR CRACKING

Guaranteed Results

Send for completely descriptive circular

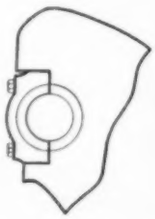
DENFIS *Chemical Laboratories Inc.*

172 PACIFIC ST. (Phone UL 5-5295) BROOKLYN 2, N. Y.

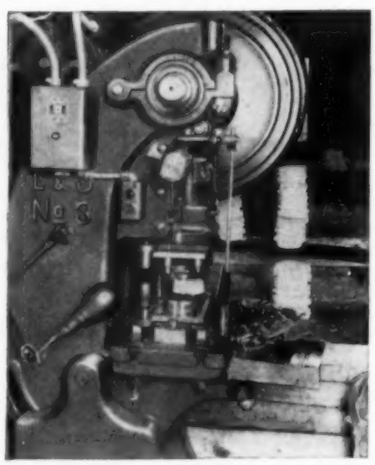
Lots of little things make

L & J PRESSES BETTER!

FOR instance, the method by which the bearing load is conveyed to the frame on *both the up and down* strokes. Bearing caps remain tight, as the studs are not loaded when pulling dies out of a drawn piece of work.



Check every detail of an L & J Press and you'll find lots of little things—and big things too—that assure a longer service life, lower maintenance costs and a better product — things learned in nearly a half century of working with press users—things that make L & J Press first choice of so many companies. Send for catalog.



Dependable L & J Sales Engineers at Your Service

STANDARD SINCE 1913

L & J PRESS CORP.

SUCCESSORS TO LOSH-BOUGH JORDAN TOOL & MACHINE CO.

1629 Sterling Ave. Elkhart, Ind.

a working period starts after a night of rest, the best time to put everyone in a good morning spirit is just when the employee starts working.

It doesn't cost management any more to come around and greet labor cheerfully in the morning. A cheerful "Good Morning" just means that management and labor will try their best that day.

Walter Dimitruk
New York, N. Y.

•

Like all other approaches to each day, the cheery "Good Morning" has its advantages, but can, without too much trouble, become nothing more than a sham and perhaps an indirect insult to normal human beings.

Every free-thinking employee knows that his superior is just a human being the same as he, who is affected by outside influences just the same. He also knows that no man can lightly shrug off the pressure of such influences with a mere "Good Morning" to everybody. We all agree that the man who can surmount such pressures, and still be cheerful, is quite a magician.

The foreman or supervisor who can control his emotions well enough to keep level-headed in dealing with his subordinates, yet at the same time, be human enough to realize that it is his mastery of pressures of both outside and inside influences that builds his leadership ability, is the man who not only enjoys the respect but the confidences of his men—"Good Morning" or no "Good Morning."

The day of the "whip-cracking" and the proverbial "green carpet" is as ancient as Greek mythology. Unless the "Good Morning" routine is backed up with reason and understanding, one might just as well be greeted with an oath for all the good accomplished. A cheery "Good Morning" means nothing to the employee who knows that you don't mean it; who knows that your early morning spat with the wife is going to mean a very miserable day for him.

There is more value to a reasonable approach to each problem as it arises than to a thousand deceitful "Good Mornings" that are followed up with unreasonableness.

Most "bawling outs" follow a mistake, but the fellow who makes no mistakes is the fellow who is doing nothing. Reason with the man about his mistake rather than bawl him out and you gain more cooperation than all of the "Good Mornings" of a lifetime.

A "Good Morning" lasts but a moment but common sense lasts the

whole day. While both are important, the first is without value unless the second is assured.

Employees who are permitted to work *with* their superior rather than *for* him, do not put as much store by a cheery "Good Morning" as they do by the knowledge that the boss is a reasonable man at all times and also a man who can be touched by human tendencies such as pressure from outside influences.

One would rather hate to work for a man who was not emotionally affected by a spat with his wife. But we still think more of the man who does not let that spat interfere with his relations with us as individuals.

D. W. Hartzell
Model Shop, Bryant Heater Company

•

It has always been my practice to go among my men in the morning and greet them. Then at night when I meet the odd one or two, I make it a point also to say "Good Night" to them. When vacation times comes or when someone is taking a day or so for a pleasure trip, I always express my wish to the person that I trust he obtains the pleasure he is seeking.

I have found this is a good principle to follow. It does no harm to the morale of a shop to be courteous to those men or women under you. I firmly believe it pays in dividends of respect for the foreman or higher executive who follows this practice, within reason. It cannot be considered as a form of fraternizing that could be taken advantage of by some and lead to a breakdown of any executive dignity between him and the help.

You find it pays for instance in examples like this: John Doe just had to be called down by me over a serious fault he was repeatedly committing. Next morning I greeted him as usual. I later was told the man was surprised at this and expected me to be sour on him for days.

His fellow-worker told him: "You broke a company rule and he told you off. He is not mad at you; he is that kind." That man never to my knowledge broke that rule again. So my courtesy paid well toward respect for company rules and myself.

While working as a plain tool-and-die maker, I have met up with some foremen who ignored this rule of respect entirely toward those under them. I admit my opinion of them was that they were arrogant and felt their oats. So I decided not to commit the same error myself.

My best example for greeting people in this courteous manner was in the National Cash Register Company

LOVEJOY SERVICE ENGINEERS

. . . always ready to assist you with your milling and cutter grinding problems

Don Proctor has been with Lovejoy for 31 years

Lovejoy Tool Company, Inc.
Springfield,
Vermont

Attention Mr. C. Jenness Cameron

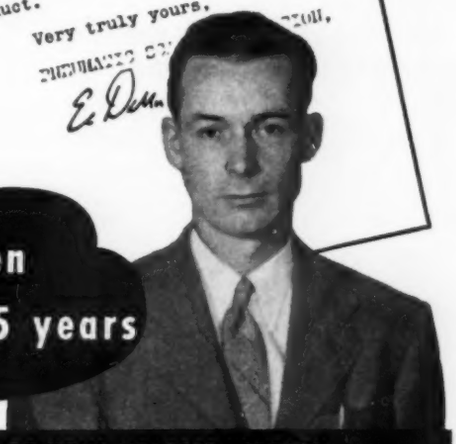
Dear Mr. Cameron:

May we express our deep appreciation of your splendid cooperation in sending your Service Engineer to straighten out our carbide problems.

We have not only received a liberal education on carbide milling, but, have carefully tabulated this information and issued it to all supervisors interested in milling and also a list of precautions for the operators.

Your Service Engineer is a worthy representative of a high grade product.

Very truly yours,



Don Rice has been with Lovejoy for 15 years

CALL THE HOME OFFICE OR YOUR NEAREST LOVEJOY REPRESENTATIVE FOR DETAILS

Almquist Bros.
Los Angeles 11, Calif.

L. A. Benson Co.
Baltimore 2, Md.
Charlotte, N. C.

Burleigh-Stocker Mach. Co.
Pleasant Ridge, Mich.

A. M. David
West Hartford, Conn.

John DiEugenio
Phoenix, Arizona
Denver 6, Colo.

Eastern Carbide Corp.
New Rochelle, N. Y.

Ellfeldt Mach. & Supply Co.
Kansas City 6, Mo.

Joseph E. Fletcher
San Francisco 3, Calif.

Walter F. Greene
Indianapolis 8, Ind.

L. V. Swartz
Dayton, Ohio

Walter R. Hammond Co.
Minneapolis 15, Minn.

Harris Pump & Supply Co.
S. S. Pittsburgh 3, Penn.

C. J. Harter, Machinery
Dallas & Houston, Texas

Industrial Equip. Co.
Tulsa 1, Oklahoma

G. E. Jones
Detroit 21, Michigan

W. H. Jones
Norwood, Penn.

Austin Ford Logan
Buffalo 2, N. Y.
Cleveland 3, Ohio
Syracuse 3, N. Y.

Production Products Co.
Seattle 4, Washington

R. H. Roenspies
Lombard, Illinois

K. P. Wesseling Co.
St. Louis 3, Missouri

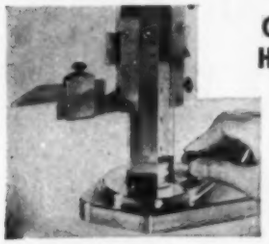
Williams-Collins, Inc.
Milwaukee 3, Wisconsin

Geo. E. Zweifel & Co.
Portland 4, Oregon

LOVEJOY TOOL COMPANY, INC.
SPRINGFIELD, VERMONT, U. S. A.

SCHERR *aids to precision – production*

Will not shift while measuring—

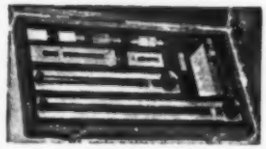


CHESTERMAN HEIGHT GAGE

A big, sturdy stabilized instrument. Fine adjustment by screw operated from knurled nut on base (see photo) eliminates all chance of rocking or shifting instrument while measuring. Finger pressure on two lugs frees split nut for rapid up or down adjustment of the head. 2½" long vernier in place of the normal 5/8" vernier provides greater visibility without the need of magnifier or removing gage from work. Both English and metric readings, one on each face of column. Made in sizes from 12" to 48"—capacities sufficient for the most unusual measurements.

Makes gage blocks doubly useful

GAGE BLOCK UTILITY SET



Quick adjustable type holders. Greatly expands the usefulness of any set of standard gage blocks. The complete set includes four holders — 2", 4", 8" and 12", two jaws each for inside and outside measurements, a 60 deg., center point, a scriber point, and a substantial height gage base. Holders have no long projecting screws to make handling awkward. Every shop can profitably use one or more of these economically-priced sets, which will save their cost many times over by applying gage block accuracy at first hand, with no variation through the use of any other tool. Any parts of this set can be furnished separately at moderate cost. Set $98.50.

Two instruments for measuring cutting and wheel speeds—

Price $67.50

SCHERR Hand TACHOMETER

Measures rpm without timing or calculation while held against end of rotating shaft. Any variation in speed caused by belt slipping, overload, etc., is instantly noted. Also have disc for measuring surface speeds in feet per min. Made for speeds from 30 to 12,000 changing speed range by new rotating shift mechanism. Other types to 48,000 rpm. Write for details.

SCHERR SPEED INDICATOR

Gives direct readings in rpm in a test requiring only 6 seconds. Needle remains at reading until released by pressure of button. Also measures linear speeds using disc attachment. Two types, ranges to 20,000 rpm. Full data on this and other Scherr speed measuring instruments on request.

Price $37.50

Write for full details on these tools, and for the Scherr Small Tool Catalog.

GEO. SCHERR CO., Inc.

[illegible] St. New York 12, N. Y.

years ago. The president of that firm, James Paterson, made it a practice to go out into the factory daily and greet the workmen with a happy "Good Morning." If it was harmful, surely he would never have continued the practice—and I wouldn't have remembered it for so long.

Henry Rasmussen
Niagara Falls, N. Y.

NEW BOOKS

THE METRIC SYSTEM OF WEIGHTS AND MEASURES—*Compiled by the Committee on the Metric System, National Council of Teachers of Mathematics. Published by the Bureau of Publications, Teachers College, Columbia University, New York, N. Y. 303 pages. Price $3.*

This 20th yearbook of the National Council of Teachers of Mathematics contains facts, history and comments on the metric system, compiled from individual and group sources and from the press. Its purpose is to convince the reader that a change from English to metric units should be made.

Written on a teacher's level—though not technical in the scientific sense—the book contains many aids to teachers in advancing the metric system to the student. The conclusion, a valid one, is that the system must be educated into the nation and cannot be adopted at one time.

•

MACHINE DESIGN—*By Paul H. Black, Professor of Machine Design, Cornell University. Published by McGraw-Hill Book Co., New York, N. Y. 344 pages. Price $4.*

Basic elements of machine design are covered in this college-grade text, including material on machine members and elements, materials and fits and finishes. Drawings, nearly all line drawings, with some charts and curves, are excellent, and the text is concisely written in uncomplicated language.

An outstanding value of the book is its lack of the usual qualifying phrases and nonessential empirical theories that usually clutter up such texts. Unfortunately, along with excellent material in the text, the author did not include visual information to match. There are practically no photographs of actual machines or components. This may reduce the value of the book, but it is still a better-than-average classroom text.

CARBIDE TOOLS **TOO COSTLY** FOR YOUR REAMING JOBS?

NOT *with* Staples CARBIDE-TIPPED *ECONOCUT* REAMERS!

NOW the advantages of carbide reaming — greatly increased tool life, finer hole finish, greater production—are available for your reaming jobs at STILL GREATER REDUCTION IN TOOL COSTS — with Staples ECONOCUT Reamers.

These are precision tools. ECONOCUT Reamers have diamond lapped cutting edges, and standard tolerance of .0005" is held on diameter. However, these record low prices are made possible by standardizing ECONOCUT on straight shank, straight flute tools, in the most widely used size range.

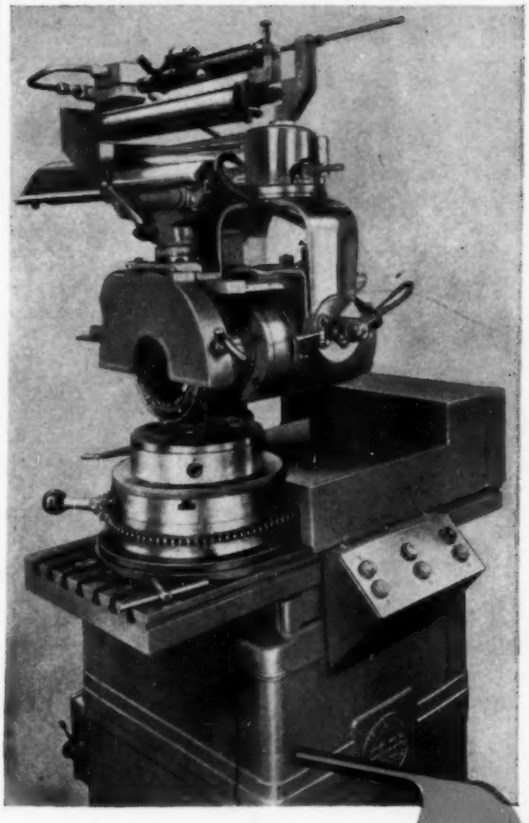
Hundreds of shops, large and small, are now showing considerable savings through ECONOCUT reaming. You will too. See your Staples distributor, or order direct. ECONOCUT Reamers are available for immediate delivery in the sizes and at the prices shown in the table below.

WRITE FOR YOUR COMPLETE STAPLES TOOL CATALOG

STRAIGHT SHANK—STRAIGHT FLUTES					
Diam.	Tip Length	No. of Flutes	Shank Diam.	Over-all Length	PRICE
1/4"	1/2"	4	15/64"	6"	$3.75 ea.
9/32	1/2	4	15/64	6	4.00
5/16	1/2	4	9/32	6	4.00
11/32	11/16	4	9/32	6	4.25
3/8	11/16	4	5/16	7	4.25
13/32	11/16	4	5/16	7	4.75
7/16	11/16	4	3/8	7	4.75
15/32	1	4	3/8	7	5.00
1/2	1	6	7/16	8	5.50
17/32	1	6	7/16	8	5.75
9/16	1	6	7/16	8	5.75
19/32	1	6	7/16	8	6.25
5/8	1	6	9/16	9	6.25

NOTE For taper shank requirements, use standard split sleeve reamer driver. Available at moderate price.

THE STAPLES TOOL CO.
CINCINNATI 25, OHIO



At the production rate of three pieces per minute, the S. K. Wellman Company of Cleveland, Ohio, is performing grooving operations on powdered metal aircraft parts approximately four times faster than ever before. This has been achieved by incorporating several automatic devices with a standard Walker-Turner Radial Cut-Off Machine to convert it into an automatic-radial grooving machine.

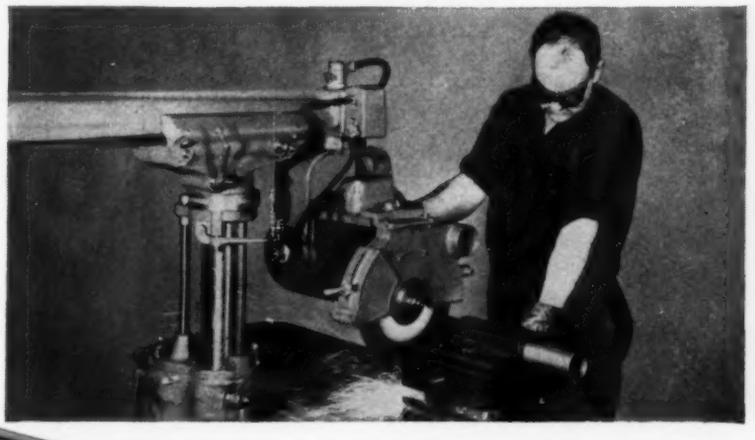
For this grooving operation the Radial Cut-Off Machine is equipped with a diamond impregnated metal wheel to do the cutting, and a magnetic chuck for work holding. The sliding head is motivated by an air cylinder with provisions for metering the feed. With this set-up extremely accurate work is done—the depth of each groove held within .003", and the accuracy of the index within .005".

In addition to increased production, Walker-Turner Machine Tools have given the S. K. Wellman Company continued operation with trouble-free maintenance. Says Mr. S. E. Truesdell of the company's engineering department: "Three Walker-Turner machines have been in our possession about five years, and in that period a very minimum, if any, maintenance has been required. We find these machines ... *are highly adaptable to intricate machining jobs with minimum set-up time.*"

For complete catalog, write to Walker-Turner Division, Kearney & Trecker Corporation, Plainfield, New Jersey.

Photo left: Radial Cut-Off Machine in S. K. Wellman set-up for radial grooving with magnetic chuck and diamond wheel. Indexes automatically at the end of each ram traverse cycle.

Photo, below: Radial Cut-off Machine, Model MRA-1130, 3 h.p., 3450 r.p.m. motor. Price: Less abrasive wheel, magnetic overload release and base $494.50.



FOR EXAMPLE

GROOVING OPERATIONS 4 TIMES FASTER
by S. K. WELLMAN COMPANY
with WALKER-TURNER radial cut-off machine

walker-turner **MACHINE TOOLS**

DRILL PRESSES—HAND AND POWER FEED
RADIAL DRILLS • RADIAL SAWS
BAND SAWS—FOR WOOD OR METAL
RADIAL METAL CUT-OFF MACHINES • MOTORS

BURR

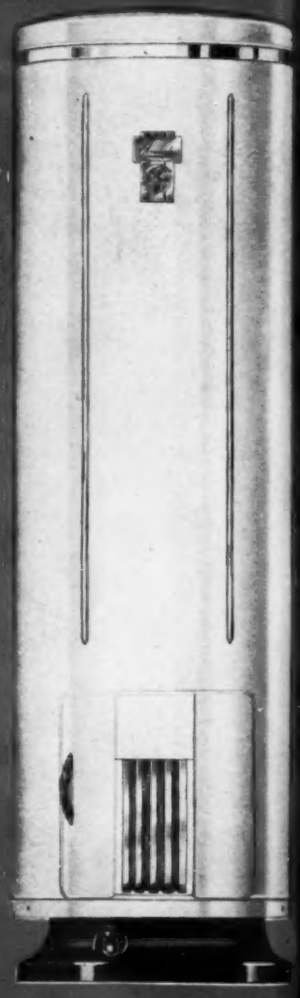
SOLD ONLY BY AUTHORIZED INDUSTRIAL MACHINERY DISTRIBUTORS

A. O. SMITH

LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

LAKE ERIE Hydraulic Press

THE A. O. SMITH Corporation of Milwaukee, Wisconsin report that the Lake Erie Hydraulic Press in their Kankakee plant meets every expectation. In their own words, "It is an excellent press for heavy materials and it is easy to set up and operate. Rate of production and quality of parts are gratifying." Today, leaders in metal forming such as A. O. Smith Corporation are taking advantage of the efficiencies possible with these newer hydraulic presses. They are enjoying increased production, improved product quality and lower unit costs. Why not consult Lake Erie about the possibilities for hydraulic press applications in your production. No obligation whatsoever.



PERMAGLAS automatic water heater manufactured by A. O. Smith Corporation has glass-lined tank, Fiberglas insulation and many other new features. Tank ends and covers are efficiently produced on Lake Erie Hydraulic Press.

TWO MEN OPERATE the press. One man feeds parts in and the other removes them. Water heater tank heads are produced at the rate of 237 per hour, base plates at the rate of 259 per hour.

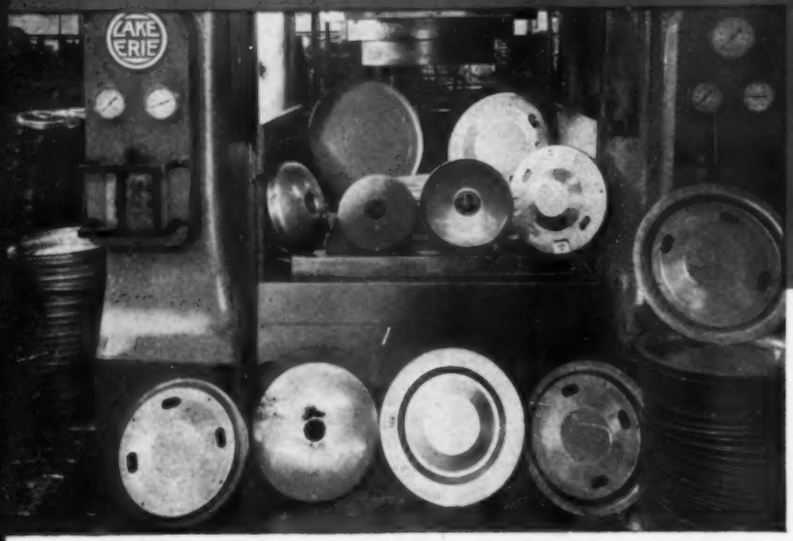


ILLUSTRATION SHOWS various water heater tank pieces produced and operations performed. The press is a versatile unit, easy to set up and operate, and forms heavy material (⅛" sheet steel) with ease and precision.

LAKE ERIE ENGINEERING CORP.

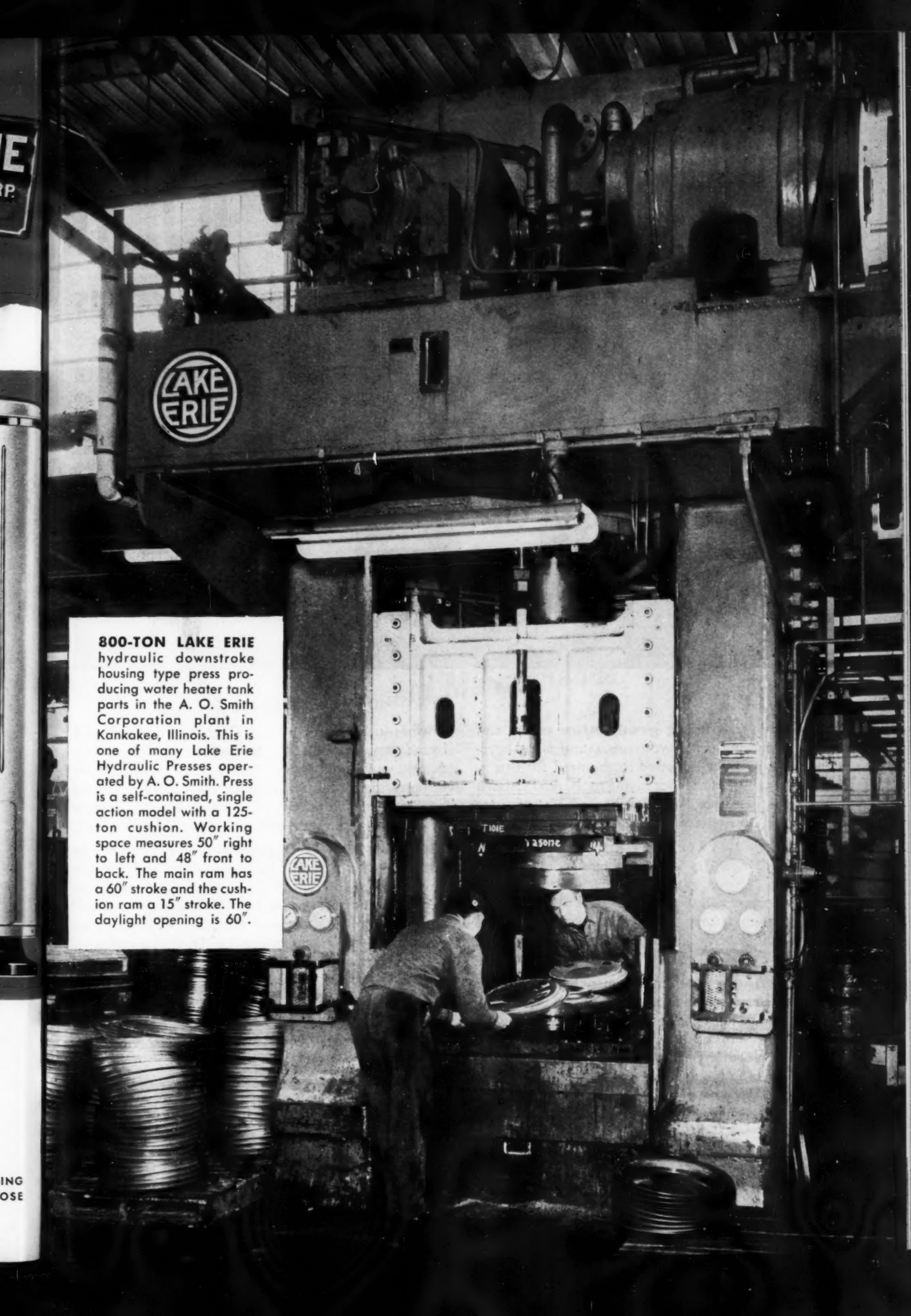
MANUFACTURERS OF
HYDRAULIC PRESSES AND SPECIAL MACHINERY

General Offices and Plant:

507 Woodward Avenue, Buffalo 17, New York

OFFICES IN PRINCIPAL CITIES AND FOREIGN COUNTRIES

LEADING MANUFACTURER OF HYDRAULIC PRESSES—ALL SIZES AND TYPES—METAL WORKING...PLASTICS MOLDING FORGING...METAL EXTRUSION....PROCESSING....RUBBER VULCANIZING...STEREOTYPING...SPECIAL PURPOSE



800-TON LAKE ERIE hydraulic downstroke housing type press producing water heater tank parts in the A. O. Smith Corporation plant in Kankakee, Illinois. This is one of many Lake Erie Hydraulic Presses operated by A. O. Smith. Press is a self-contained, single action model with a 125-ton cushion. Working space measures 50″ right to left and 48″ front to back. The main ram has a 60″ stroke and the cushion ram a 15″ stroke. The daylight opening is 60″.

These OSBORN BRUSHES are REAL COST CUTTING TOOLS!

For industrial production and maintenance operations

Because of zooming production costs and the ever narrowing gap between profits and actual operation losses, industry is alerted to the need for better, more efficient time and labor saving tools. And Osborn Power Driven Brushes, Paint Brushes and Maintenance Brushes are finding ready acceptance for many industrial applications.

Specific example is the Osborn Monitor Wire Wheel Brush, shown in the upper left photo, used for deburring and removing sharp edges on the outside of ball bearing separators at the Jamestown, N. Y. plant of the Marlin-Rockwell Corporation with improved production of 400%!

In maintenance, too, management has learned the value of efficient cleaning tools—for sweeping, dusting, washing or scrubbing. The new light weight, "work balanced," full tufted Osborn Master Sweep Floor Brush, shown in the center photo, sharply reduces sweeping costs by cleaning larger areas easier and in less time.

Osborn's complete line of paint and varnish brushes includes every type of painting tool required by industry. Typical of hundreds of industrial users, Pan American World Airways System has standardized on Osborn's better built brushes for their Latin American Base in Miami, Florida. The upper right photo illustrates a refinishing application on the exterior of a PAA air liner.

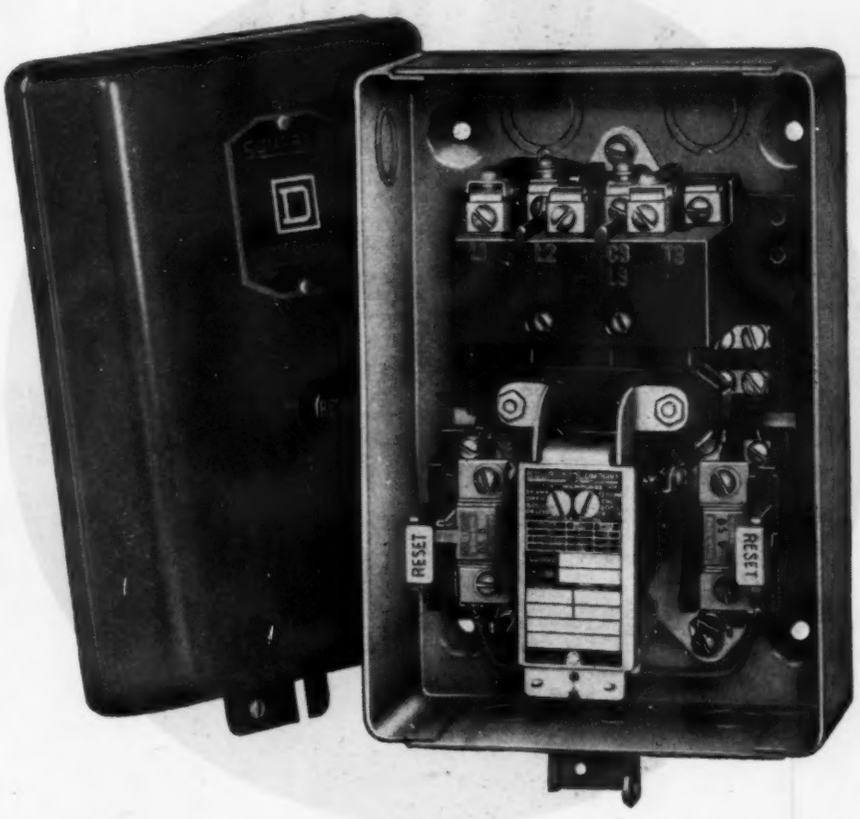
There is hardly a product — or material — or service — which cannot be made better and for less money by the correct use of Osborn brushing tools and new brushing techniques. Let us send a trained field engineer to make a study of your present or projected operations without obligation. He'll tell you frankly if and how Osborn can help cut your maintenance and production costs.

Osborn Brushes are stocked by leading industrial supply distributors.

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue — Cleveland, Ohio

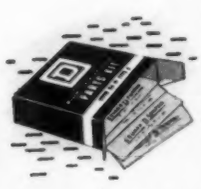
Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY • POWER DRIVEN BRUSHES • PAINT BRUSHES • MAINTENANCE BRUSHES



Even the *Best* MOTOR STARTERS Need Inspection and Maintenance

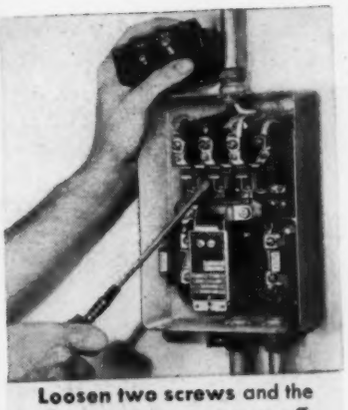
ALL starters require periodic contact replacement under conditions of heavy load or frequent operation. Some may require magnet coil exchange to match voltage and frequency of power supply. That's why Square D has always stressed accessibility—simplifying installation, inspection and normal maintenance.



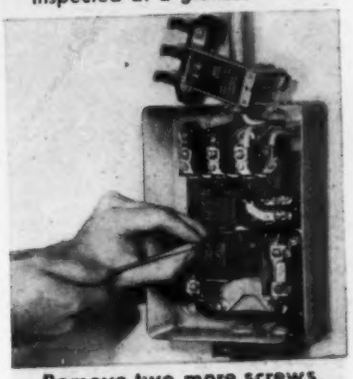
NEW "OFF-THE-SHELF" PARTS KITS MAKE NORMAL MAINTENANCE EASIER THAN EVER!

• Now, replacement parts for Square D starters are packaged in easy-to-stock kits. Each kit contains parts necessary to replace all load contacts on two or three-pole starters. Parts are individually packaged in clearly labeled envelopes. An illustrated service bulletin is enclosed to provide quick parts identification and complete installation instructions.

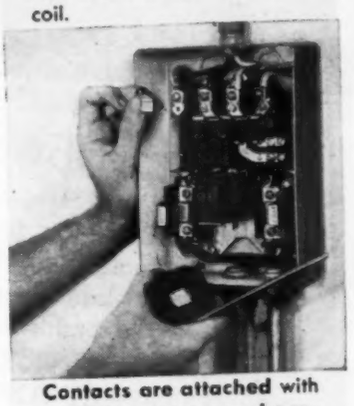
Write for Bulletins 8536 and 9998. Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin



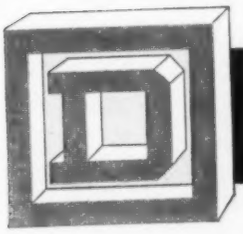
Loosen two screws and the arc chamber cover comes off. Every contact surface can be inspected at a glance.



Remove two more screws and entire armature and movable contact assembly can be lifted off. Disconnect two wires from screw-type terminals and slip off magnet coil.



Contacts are attached with separate screws—can be removed and replaced without disturbing any wiring. Screwdriver is only tool needed.



SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

In AO SPECTACLE SAFETY GOGGLES

AO ACETATE SAFETY GOGGLES
(Non-flammable cellulose acetate butyrate)
Especially recommended for chemical and electrical work and similar operations where sparks may cause fire or explosion.

Whether You Choose Acetate or Metal Frames

AO METAL SPECTACLE GOGGLES

You'll Be Sure of **Dependable Safety**

Whether you prefer AO Acetate or Metal Spectacle Safety Goggles, 6 Curve Super Armorplate Lenses assure you of dependable safety. In addition, you get the *plus values* of UNOBSTRUCTED VISION, MAXIMUM COMFORT AND SMART APPEARANCE! In both the AO F-9200 Series Acetate Goggles and the F-3100 Series Metal Goggles, men work *safely* and more *efficiently*. High set end-pieces take hinges and temples out of the line of sight, provide a clear view of the work without obstruction. Ventilated side shields give extra protection on jobs where foreign particles may strike laterally.

Bridges are strong—yet light in weight for wearing ease. Nose pads give added comfort by evenly spreading goggle weight. Your AO Safety Representative can supply you with these pleasant-to-wear, good looking goggles in either metal or acetate.

Safety Division American Optical COMPANY

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL INDUSTRIAL CITIES

A-H5

(5 PCT CHROME AIR-HARDENING)

A-H5 combines the safety of air-hardening with excellent resistance to distortion. It is deep-hardening in large sections and has high resistance to shock and wear. Shown is a ring gauge made of A-H5.

An air-hardening tool steel *that's easy to machine*

Air-hardening tool steels are the best choice for many tools and dies, but the more highly-alloyed of these grades often present machining problems. Toolmakers like A-H5 because this lower-alloy type is annealed to 212 Brinell or less for easy-machining, yet provides the great safety of air-hardening.

A-H5 is recommended for the same tool and die jobs where you are using the standard oil-hardening tool steels such as BTR (Bethlehem Tool Room). A-H5 is of course the choice when a relatively drastic quench in oil is not permissible. And it is preferred when you need deeper hardening, greater resistance to distortion, and higher wear-resistance for cutting edges.

Use A-H5 for dies, punches, blanking tools, cold-forming dies, master tools and the like. Give it a thorough trial and you'll agree that it belongs in your tool room. The nearest Bethlehem sales office or tool steel distributor will gladly give you full details and arrange for prompt delivery.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

QUICK FACTS ABOUT A-H5

	C	Mn	Cr	Mo	V
Typical Analysis:	1.00	0.60	5.25	1.10	0.25

Annealing: Pack, heat to 1650 F, slow furnace-cool, Brinell 212 max

Preheating: 1200 to 1250 F, prior to hardening

Hardening: 1775 F, air-quench

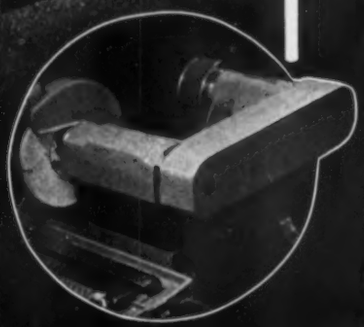
Tempering: 350 to 400 F, Rockwell C 60 to 62

★ BETHLEHEM STEEL ★

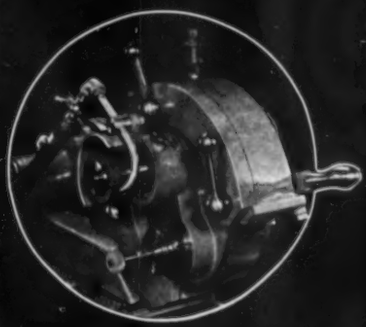
A-H5 ... one of Bethlehem's fine tool steels

Designed for EFFICIENCY

TO PRODUCE MORE OF A GREATER VARIETY THRU EASE OF PRECISION SET UP AND OPERATION



External Bracket



Internal, External Turret

The Rivett No. 104 is a simple, power-driven grinder suitable for tool making and precision manufacturing. Operations of widely varying nature can be quickly set-up and efficiently ground on one or many pieces. Interchangeable brackets are selectively mounted on the cross slide for internal, external, or concentric grinding in straight, taper, face or shoulder form.

RANGE

Internal spindles of suitable design and speed may be selected for hole grinding up to approximately 3" diameter and 4" length.

External bracket with 7" x ½" wheel may be used for on-center or chucked work up to approximately 3" diameter.

Turret for concentric grinding of hole or outside surface is limited to such work as may be chucked.

ARMY NAVY

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON · BOSTON · MASS. · U. S. A.

Write for Bulletin 104.

ONLY PHILLIPS RECESSED HEAD SCREWS

have Dimensional Uniformity assured by close ENGINEERING CONTROL

ESTABLISHED STANDARDS... Every manufacturer of Phillips Cross Recessed Head Screws is supplied with complete engineering and production data which prescribes precise dimensions and tolerances.
CENTRALIZED PRODUCTION TRAINING... And, before production is started on Phillips Screws, each plant's supervisory staff puts in an extended training period with Phillips engineers.
COMMON SOURCE OF RECESS FORMING TOOLS ... Punches for forming the Phillips Cross Recess in all types and sizes of Phillips Screws are formed from master type at one plant. The manufacture of gauges for maintaining uniformity of Phillips Driver and Bits are similarly centralized.
ENGINEERS' MEETINGS... Standards carefully established at the very beginning are rigorously maintained through meetings of "Phillips Recessed Head Standards Committee". Engineers from all plants meet to exchange ideas, discuss problems and learn about recent developments.

These elaborate precautions, this checking at every point and by every means makes sure you can depend on constant dimensional uniformity in Phillips Screws. They are *engineered* for PRACTICAL PRODUCTION . . . every screw and driver work together perfectly, in every size, every time. And this is just one of the five important reasons why only Phillips Cross Recessed Head Screws give you *all* the advantages of the cross recess design.

GET ALL THE ADVANTAGES OF ASSEMBLY WITH CROSS RECESSED HEAD SCREWS . . .

GET **PHILLIPS** *Recessed Head* **SCREWS**

Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

27 SOURCES

American Screw Co.
Camcar Products Co.
Central Screw Co.
Continental Screw Co.
Corbin Screw Div. of American Hdwe. Corp.
Elco Tool & Screw Corp.
The H. M. Harper Co.
Lamson & Sessions Co.
Milford Rivet and Machine Co.
National Lock Co.
National Screw & Mfg. Co.
New England Screw Co.
Parker-Kalon Corporation
Pawtucket Screw Co.
Pheoll Manufacturing Co.
Reading Screw Co.
Rockford Screw Products Co.
Russell Burdsall & Ward Bolt & Nut Co.
Scovill Manufacturing Co.
Seaboard Screw Corp.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd.
Sterling Bolt Co.
Stronghold Screw Products, Inc.
Wales-Beech Corp.
Wolverine Bolt Company

Get this new Fact-Full Booklet

that lets you in on the important facts you can't afford to overlook when you choose cross recessed head screws. It's FREE. Use the coupon.

Phillips Screw Mfrs.,
c/o Horton-Noyes Co.
1800 Industrial Trust Bldg.
Providence, R. I. AM-36

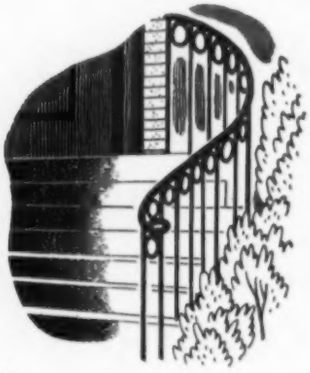
Send me the new booklet—"How to Select Recessed Head Screws for Practical Production Driving".

Name _____

Company _____

Address _____

IMPORTANT REASONS WHY YOU SHOULD USE PARKERIZING



1 CORROSION RESISTANT

For corrosion control on parts, castings, forgings, and assemblies of iron and steel, Parkerizing has been a standard process for more than 30 years.

PARKERIZING • PARKERIZING

2 ATTRACTIVE

Parkerizing adds to the appearance of treated products. Combined with stains or oils, a soft matte black finish is produced to give greater eye appeal as well as increased serviceability.

PARKERIZING • PARKERIZING

3 ECONOMICAL

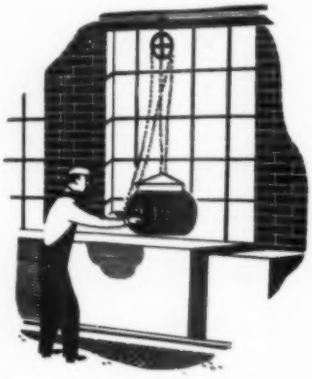
Cost of Parkerizing is still at its pre-war low, while efficiency has been increased. Processing time has been decreased, too. Now, more than ever, the economy of Parkerizing recommends its use.

PARKERIZING • PARKERIZING • PARKERIZING • PARKERIZING

4 ADAPTABLE

The only limitation on size of parts to be treated is the size of the Parkerizing tank. Products ranging from hull plates to screws are being successfully treated with this versatile and adaptable corrosion control.

PARKERIZING • PARKERIZING



5 SIMPLE APPLICATION

Parkerizing is a simple chemical conversion process. It is easily controlled and simple to operate. It requires no electrical current. Equipment, too, is simple to install and maintain.

PARKERIZING • PARKERIZING

6 *Put Parkerizing to work for you.*

Let us tell you how it can help you solve the problems of protection from rust and corrosion on iron and steel. Write for full information.

Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat. Off.

PARKER

PARKER RUST PROOF COMPANY
2196 East Milwaukee Ave.
Detroit 11, Michigan

BONDERIZING Holds Paint to Metal . . . PARKERIZING Inhibits Rust . . . PARCO LUBRIZING Retards Wear on Friction Surfaces

How many of these toolmaking aids can you use?

Here's valuable information to bring you up-to-date on modern toolroom practices...tips on increasing die life, procedures for precision hole location, applying toolroom methods to production work, and many others.

Much of this authoritative technical data was originally published in leading trade journals in the metal working field. Now all are available in reprint form from Moore. Just use the coupon and circle the numbers of the literature you want. It's free.

MOORE SPECIAL TOOL CO., INC.
738 UNION AVENUE • BRIDGEPORT 7, CONNECTICUT

1 **How To Lower Die Costs by Increasing Die Life**—31 precautions for toolmakers with notes to guide designers.

2 **Model No. 1 Moore Jig Borer Catalog.**

3 **Model No. 2 Moore Jig Borer Catalog.**

4 **Correcting Hole Location Within .0001"**—With Moore Jig Grinders.

5 **Grinding Lead Screws Accurate to .0002" in 16"**—How lead screws for Moore Jig Borers and Jig Grinders are produced to such precise dimensions.

6 **Small Hole Grinding with Diamond-Charged Mandrels**—How it's done and the advantages over other methods.

7 **Jig Grinders Tackle Production Problems**—Case history of a tough grinding assignment.

8 **Combination Grinding Wheel Dresser**—Roll-Crushing and diamond-dressing of surface grinder wheels in one machine.

9 **Diamond or Crush-Dressed Wheels for Contour Grinding**—Applications and advantages of each method.

10 **Die Flipper "Mechanizes" Die Assembly and Try-Out Operations**—How one diemaker, alone, can assemble or take apart large dies, test alignment, drill punches in place, tap for screw holes, and perform all necessary try-out operations.

ANOTHER REASON WHY MOORE IS KNOWN AS "HOLE LOCATION HEADQUARTERS"

Here's your best source book on modern toolmaking practices—over 400 illustrations, 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes, 448 pages of text in all. Over 5000 copies sold to date. "Precision Hole Location" is available at a special price of $3.00 in U.S.A.; $3.50 outside U.S.A. Include your check or money order with the coupon below and a copy can be sent in the same mail with your free technical articles.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS
JIG GRINDERS
DIE FLIPPERS
PANTO-CRUSH WHEEL DRESSERS
HOLE LOCATION ACCESSORIES

MOORE SPECIAL TOOL CO., INC.
738 Union Avenue, Bridgeport 7, Conn.
Gentlemen: Please send me literature whose numbers I have circled below:
1 2 3 4 5 6 7 8 9 10
(Name) .....
(Company) .....
(Street and No.) .....
(City and State) .....

Speed Burring Jobs with OILSTONE FILES

Grinding Wheel Grit . . . and ALL File!

Whether it be the skillful stoning of the countless teeth in these giant reduction gears or single-stroke passes on thousands of small machined parts — burring is a production operation — its cost, a production cost.

India Oilstone files, by Norton Abrasives, speed burring jobs — with a corresponding cut in production cost — for two reasons. They are made of aluminum oxide, grinding wheel abrasive, and they're all file — not just rows of cut teeth. They cut hardened steels as well as untreated, and permit easier control of stock removal.

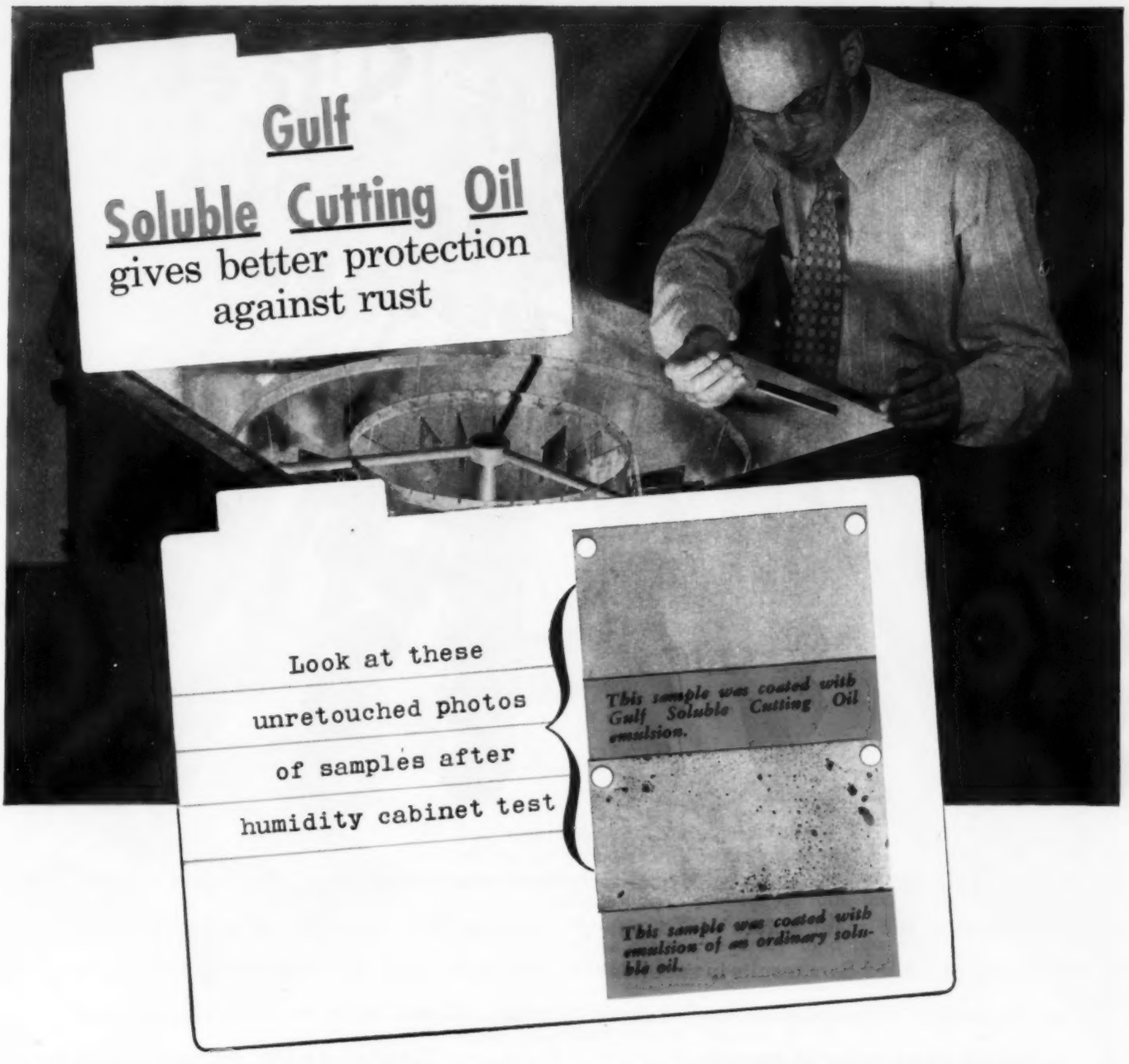
Factory oil-filled for greater chip clearance, India Oilstone files offer Industry a complete size and shape range of over a hundred standard stock items with a finish spread including coarse, medium and fine grits. Ask your distributor or write for booklet, "Oilstone Files."

Photo courtesy of Westinghouse Electric Corp.

BEHR-MANNING

BEHR-MANNING • TROY, N. Y.

ALSO QUALITY COATED ABRASIVES SINCE 1872


Gulf
Soluble Cutting Oil
gives better protection
against rust
Look at these
unretouched photos
of samples after
humidity cabinet test
This sample was coated with Gulf Soluble Cutting Oil emulsion.
This sample was coated with emulsion of an ordinary soluble oil.

Here's protection for metal parts being machined in your shop! The excellent rust preventive properties of Gulf Soluble Cutting Oil prevent rust formation between processes or when the job is left on the machine. It keeps highly finished surfaces bright longer!

The two samples shown above tell the story! Both have been exposed to a controlled flow of 120°F. air saturated with water (Relative Humidity—100%) for a period of more than two hours.

Note the startling difference! The sample coated with an emulsion of Gulf Soluble Cutting Oil shows no signs of rust formation even at the plate corners, which are more difficult to protect. The sample coated with an ordinary soluble oil emulsion is spotted with rust marks, many of which have marred the surface permanently.

This is another important plus value of Gulf Soluble Cutting Oil. For further information write, wire, or phone your nearest Gulf office.

GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

Boston · New York · Philadelphia · Pittsburgh · Atlanta
New Orleans · Houston · Louisville · Toledo

Gulf Oil Corporation · Gulf Refining Company AM
3800 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, the material I have indicated below:

☐ Further information on Gulf Soluble Cutting Oil.

☐ Practical slide-rule-type calculator for help in maintaining desired soluble oil concentrations.

Name.....

Company.....

Title.....

Address.....

THE uniformity of the high quality steel used in the manufacture of Youngstown Cold-finished Bars results in excellent machinability. Youngstown's steel makers have had many years of experience in producing these steels to the specifications which are ideal for screw machine products and many other uses. Youngstown Cold-finished Bars are produced in a wide range of shapes and sizes--straight lengths or coils. Phone, write or wire the nearest Youngstown District Sales Office and ask a representative to call and discuss your Cold-finished Bar requirements with you.

QUALITY YOUNGSTOWN SERVICE

Youngstown

COLD FINISHED CARBON AND ALLOY STEEL BARS

THE YOUNGSTOWN SHEET AND TUBE COMPANY

General Offices — Youngstown 1, Ohio

Manufacturers of Carbon, Alloy and Yoloy Steel

Export Office - 500 Fifth Avenue, New York

COLD FINISHED CARBON AND ALLOY BARS - SHEETS - PLATES - WIRE - TIE PLATES AND SPIKES - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - PIPE AND TUBULAR PRODUCTS - CONDUIT - BARS - RODS.

The MAGNA-SINE cuts tool room costs HERE

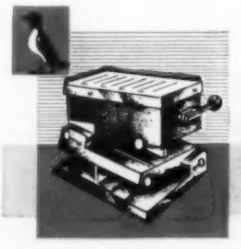
- ***For single and compound angle set-ups.***
- ***For grinding, boring, inspection and other operations.***
- ***Set up with standard gauge blocks... positive accuracy.***
- ***Permanent-magnet chuck holds work securely without distortion.***

For grinding and other operations where the work must be held at a compound angle, the Magna-Sine saves money and increases accuracy. Jobs that take an hour or more to set up by other methods can be set up securely in a few minutes with a Magna-Sine.

The Magna-Sine is set up by the sine bar method using standard gauge blocks. Work is clamped or released from the permanent magnet chuck instantly by turning the handle. The amount of magnet holding power is determined by the amount that the handle is turned—thus making it possible to hold extremely thin pieces without warpage.

Thousands of these versatile time-savers are in use daily. Many users have standardized on Magna-Sines for all angular work after seeing how the Magna-Sine pays for itself in just a few set-ups.

Write today for catalog which gives complete story on operation and models available.



OMER E. *Robbins* COMPANY

Manufacturers of the MAGNA-SINE and Other Precision Tools

5722 Twelfth Street ● Detroit 8, Michigan

"THE RIGHT FILE FOR THE JOB"

conserves materials, saves workmen's time, improves results—cuts production costs. This is one of a series of advertisements on different types of files. Save it, with the others, for shop and purchasing references.

Subject: G. P. MACHINIST'S FILE — **Prepared by Nicholson File Co.**

G.P. Machinist's File

THE "HAPPY MEDIUM" IN GENERAL PURPOSE FILES

The G.P. (General Purpose) is the very latest Nicholson development in special-design files. Virtually "two files in one," it utilizes the fundamental principles of the regular Mill (single cut) and the regular Flat (double cut) files . . . and combines them to give *metal-removing speed* with *smooth finish.*

USES. The Nicholson G.P. Machinist's File is not intended to supplant regular or special purpose files which are designed to accomplish a particular filing job in the very best manner or the shortest possible time. But to the mechanic working on *aluminum, bronze, cast iron, malleable iron, mild steels,* or *annealed tool steels,* it is an excellent general purpose file for hundreds of fabricating and machine-shop jobs. It is a thoroughly tested-and-proved file for saving time and increasing production.

CONSTRUCTION. The Nicholson G.P. Machinist's File (also made in Black Diamond brand) has the shape of a regular Flat file – except that it does not taper in thickness. It comes in 8", 10", 12" and 14" lengths. The teeth are single cut (like a regular Mill Bastard file), but are divided by angular serrations. These produce shorter cutting edges, break up the filings – help remove stock rapidly and still leave a smooth finish.

Filing aluminum with the G.P. Machinist's File

Nicholson makes special purpose files for Brass, Lead, Aluminum, Stainless Steel, Foundry Castings, Die Castings, Die Making, Lathe Filing, Curved and Shear Tooth Filing—and Swiss Pattern files of all shapes and sizes. Available through your industrial distributor.

FREE BOOK, *"FILE FILOSOPHY"*—48 interesting pages on kinds, use and care of files. Your foremen need it.

NICHOLSON U.S.A.

NICHOLSON FILE CO., 29 Acorn Street, Providence 1, Rhode Island

(In Canada, Port Hope, Ont.)

BLACK DIAMOND TRADE MARK

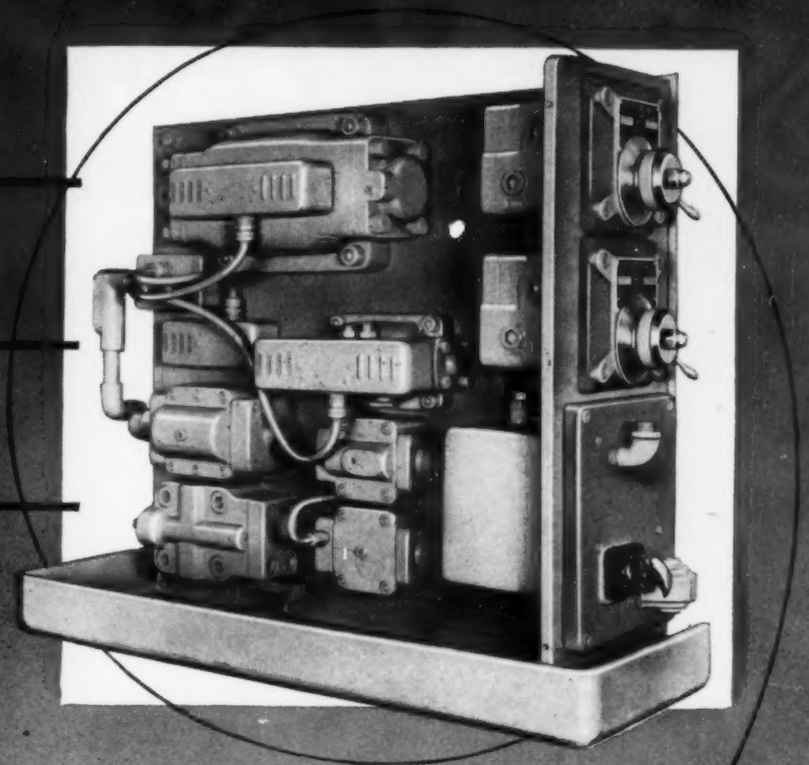
NICHOLSON FILES *FOR EVERY PURPOSE*

VICKERS Gasket Mounted Hydraulic CONTROL VALVES

Simplify Installation

Save Space

Make Adjustment Easier



All hydraulic control units for the machine are included in this group. Flow control valve adjustments convenient to operator without opening panel box.

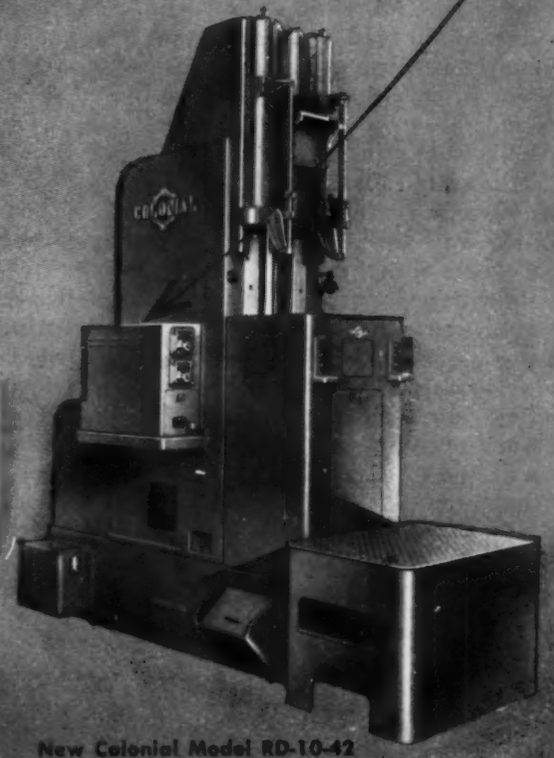
This new Colonial Pull-Down Broaching Machine is an excellent example of how Vickers Gasket Mounted Valves simplify installation, save space and make adjustment easier for hydraulic control systems.

All valves in the panel box are easily accessible for adjustment by simply removing the cover. For cleaning and other maintenance, any valve can be completely removed by just loosening the hold-down screws . . . the piping is not disturbed and the system is not drained. The installation is simplified and more compact because all hydraulic piping connections are made into the opposite side of the machined surface upon which the valves are mounted with sealing ring type gaskets. The concealed piping also results in improved appearance.

Contact the Vickers Application Engineering Office nearest you for suggestions on how Vickers Hydraulic Equipment can improve your machinery.

WRITE FOR NEW BULLETIN, 48-27

This bulletin will give you useful information regarding applications, advantages and installation drawings for Vickers Gasket Mounted Solenoid Controlled Directional Valves.

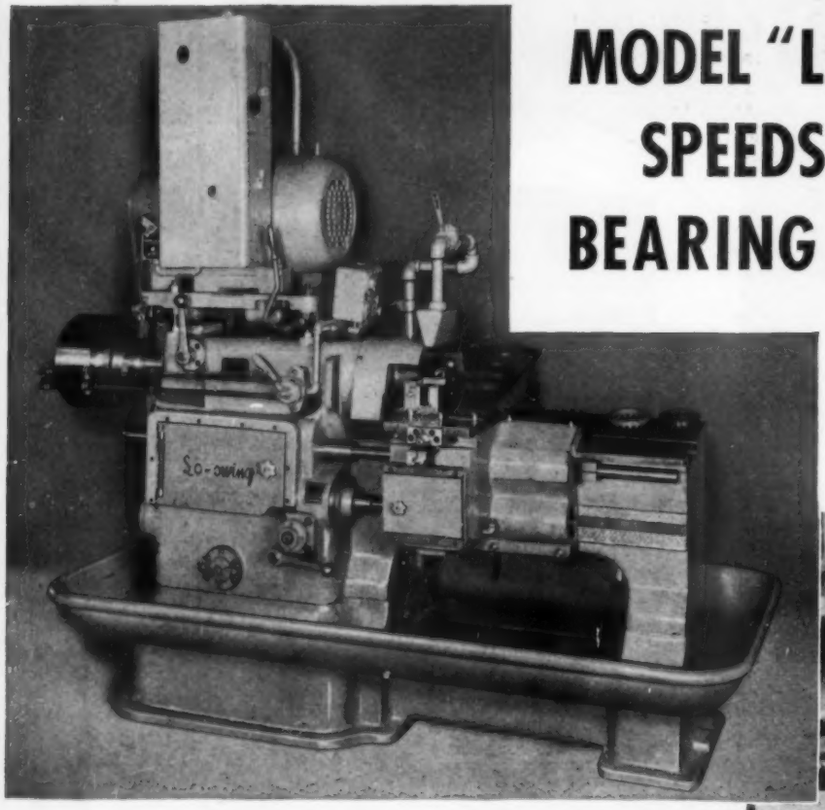


New Colonial Model RD-10-42 Pull-Down Broaching Machine has Vickers Hydraulic Controls.

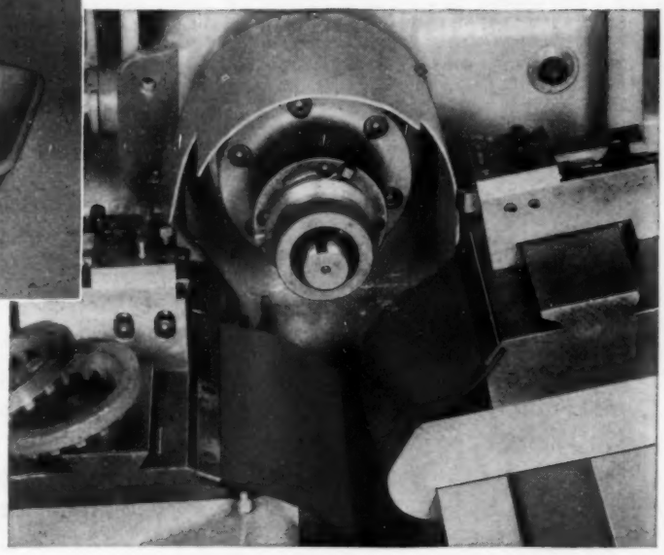
VICKERS Incorporated
DIVISION OF THE SPERRY CORPORATION
1418 OAKMAN BLVD. • DETROIT 32, MICHIGAN
Application Engineering Offices: ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DETROIT
LOS ANGELES • NEWARK • PHILADELPHIA • PITTSBURGH • ROCHESTER • ROCKFORD
ST. LOUIS • SEATTLE • TULSA • WASHINGTON • WORCESTER

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE Lo-swing PEOPLE"** SENECA FALLS, NEW YORK



MODEL "LR" Lo-swing LATHE SPEEDS PRODUCTION OF BEARING ADJUSTING RINGS

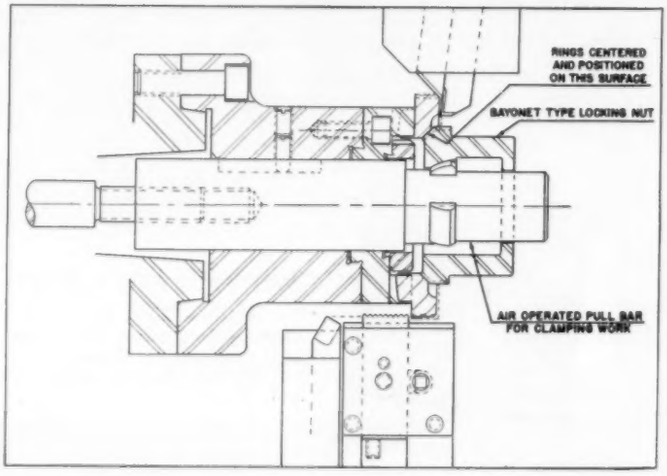


Problem: To turn, face, chamfer and thread Bearing Adjusting Rings in one operation.

Solution: The Model "LR" Automatic Lo-swing Lathe selected for this job is equipped with a special, double lead longitudinal feed cam permitting a carriage feed of .021" for the turning cycle while the balance of the cam path is cut to correspond to the number of threads per inch required on the outside diameter of the rings. The rings, delivered to the lathe without any previous machining, are mounted on a special, air-operated driver and held in position by the bayonet type locking nut shown in the line drawing. Rough and finished rings are shown in the close-up illustration.

The machining operation is fully automatic; the turning, facing and squaring tools first start cutting, after which the special threading tool, which has provision for height adjustment, cuts the thread to size. The carriage and slides return to the starting position in rapid traverse and the machine stops, ready for reloading. Production on a 4¼" diameter ring is 63 pieces per hour at 85% efficiency.

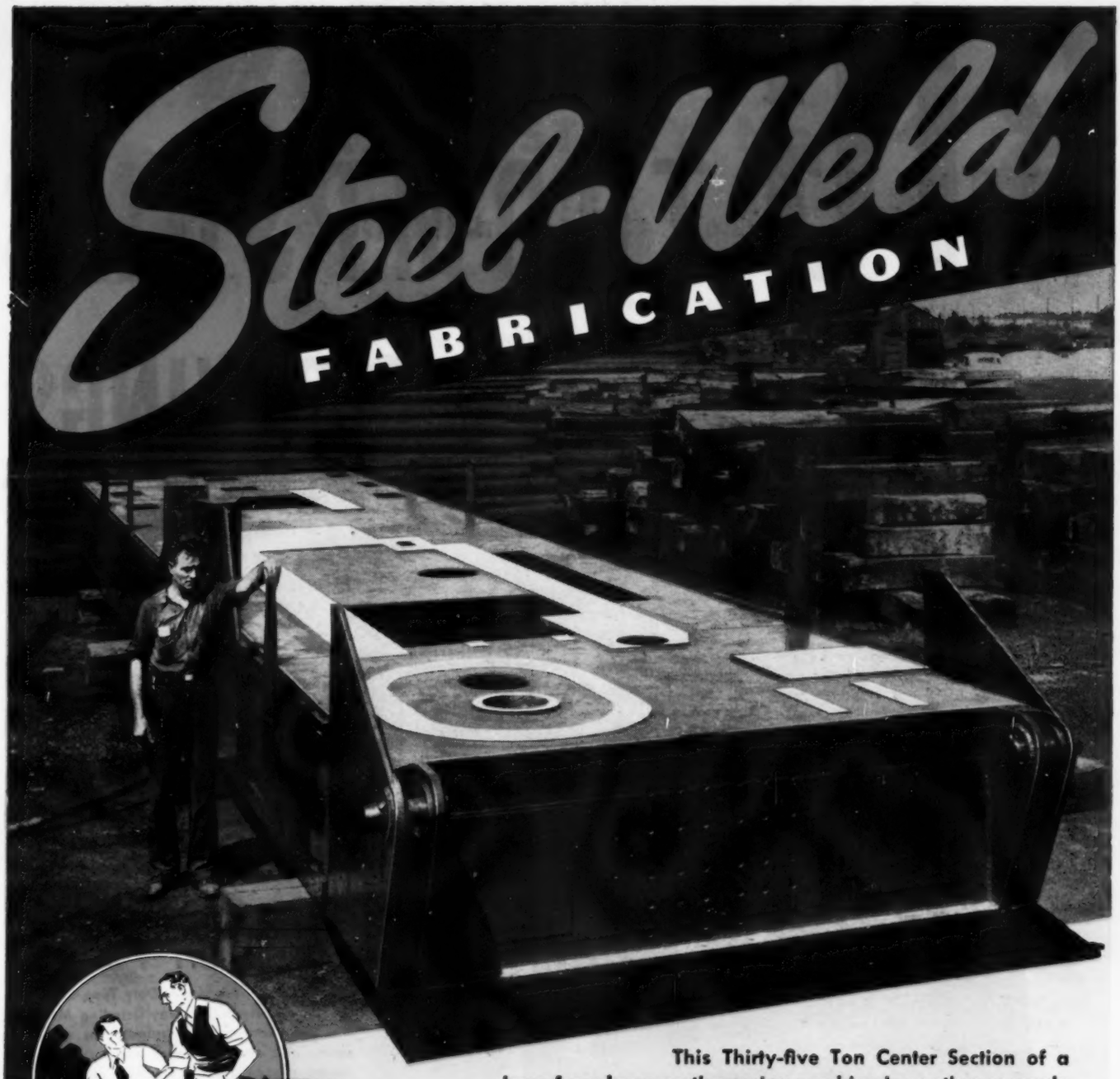
Our Engineering Department is at your service to assist in developing machines and tooling engineered for your particular machining problems.



SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

Steel-Weld FABRICATION



This Thirty-five Ton Center Section of a base for a large earth moving machine is another example of Mahon workmanship in Steel-Weld Fabrication. If you are searching for a reliable source for welded steel in any form—a source with complete, modern facilities for rough or finished machine work—the reputation of Mahon design engineering experts and Mahon master craftsmen, who have achieved a degree of excellence rarely equaled in this highly specialized art, are ample assurance that you will receive a better, smoother appearing job, embodying every advantage of Steel-Weld Fabrication.

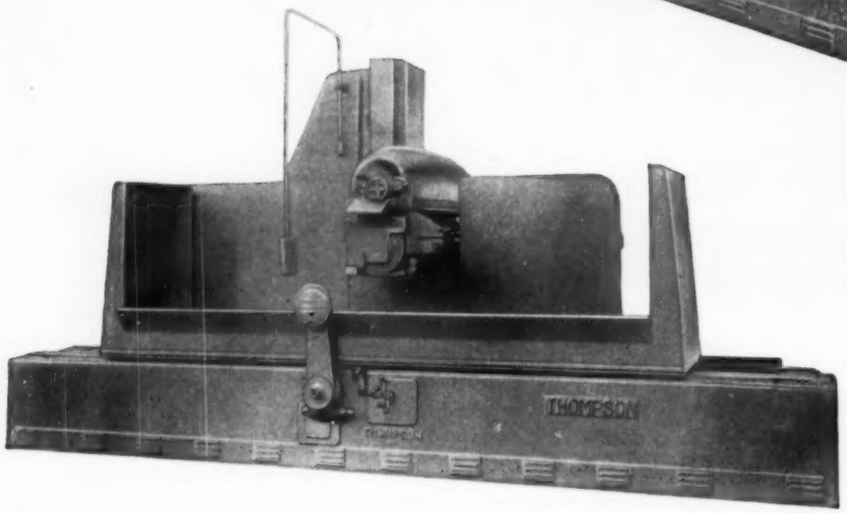
THE R. C. MAHON COMPANY
Detroit 11, Michigan

Engineers and Fabricators of Welded Steel Machine Bases and Frames, and Many Other Welded Steel Products

MAHON

BIG THOMPSONS for BIG SAVINGS

in Surface Grinding year after year!



EXAMPLE NO. 1

Above—Thompson Heavy Duty Type CX 30″ x 48″ x 196″ Hydraulic Way Grinding Machine with auxiliary vertical spindle for grinding safety gib, clamp surfaces and rack seats on machine bed. Working capacity of horizontal spindle, 240″. Bed length 46 feet.

EXAMPLE NO. 2

At left—Thompson Heavy Duty Type CX 36″ x 48″ x 120″ Hydraulic Surface Grinder. Equipped with super precision spindle powered with 40 H.P. motor.

The only manufacturer of a *complete* range of heavy duty and light duty surface and contour grinders for industry!

Write for new general catalog

Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio

Copyright 1948—The Thompson Grinder Co.

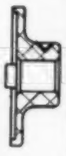
Bodine

CASE HISTORY No. 24

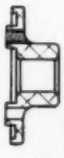
VERSATILITY: A No. 42-30 Dial Type Automatic Drilling, Tapping, Screw Inserting machine tooled to produce two different die cast electrical components.

1 HAND LOAD CASTING TO DIAL (1 PER STROKE)

2 SPOT DRILL, C'SINK SET SCREW HOLE



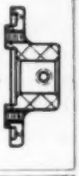
3 TAP ONE 6-32 CORED HOLE (HORIZONTAL SPINDLE)



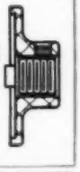
4 DRILL No 29 HOLE FOR SET SCREW

5 TAP SET SCREW HOLE 8-40

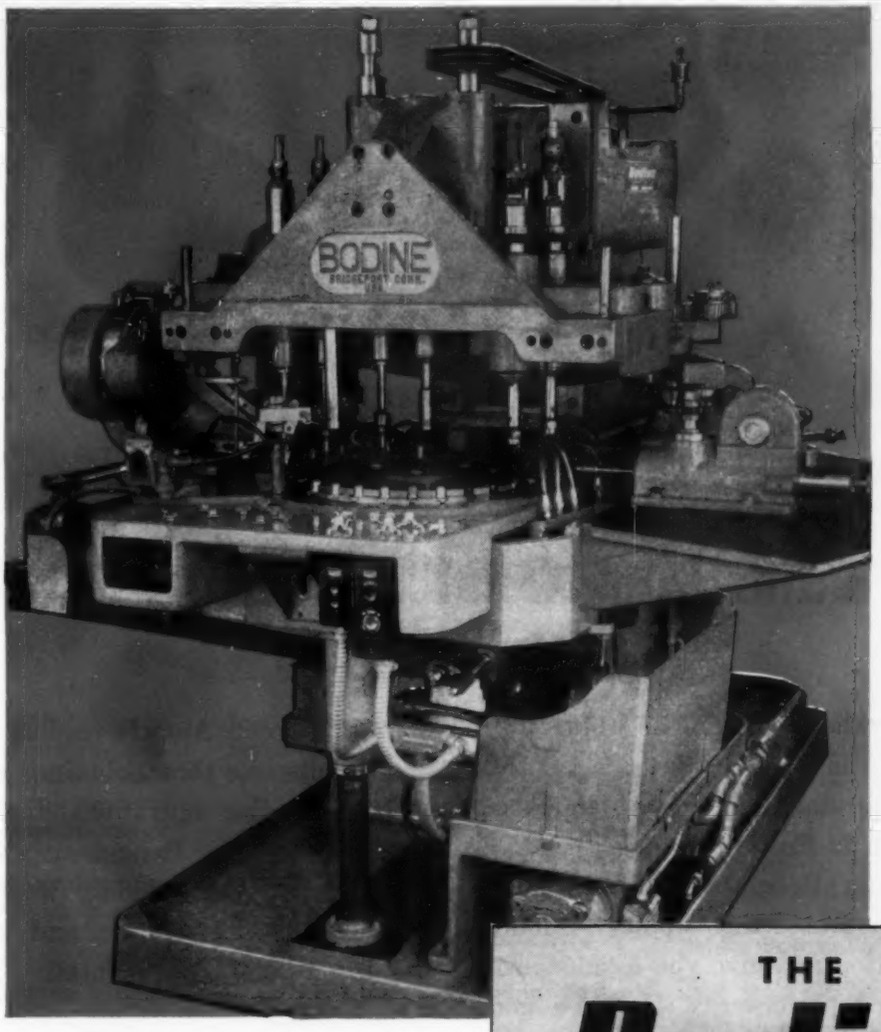
6 TAP ONE 6-32 CORED HOLE (HORIZONTAL SPINDLE)



7 TAP CORED CENTER HOLE ¼" STRAIGHT PIPE THREAD (Remove burr from set screw hole.)



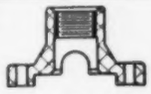
8 INSERT ONE 8-40 x ¼" SET SCREW AUTOMATIC EJECT



1 HAND LOAD CASTING TO DIAL (2 PER STROKE)

2 REAM CORED HOLE 29/64" DIA.

3 TAP CENTER HOLE ¼" STRAIGHT PIPE THREAD



4 TAP ONE 8-32 HOLE

5 TAP ONE 8-32 HOLE

6 AUTOMATIC EJECT

PRODUCTION: Each job requires its own dial and easy relocation of some spindles (all adjustable). Cap X-2740 (left above) is produced at rate of 22 pieces (154 operations) per minute. Hickey X-2666 (right above) produced 34 pieces (136 operations) per minute (2 pieces per stroke). Unless stated all spindles are vertical.

VERSATILITY of this machine can be of tremendous advantage for low cost production of a wide range of small parts. Write for recommendations. Send for Catalog.

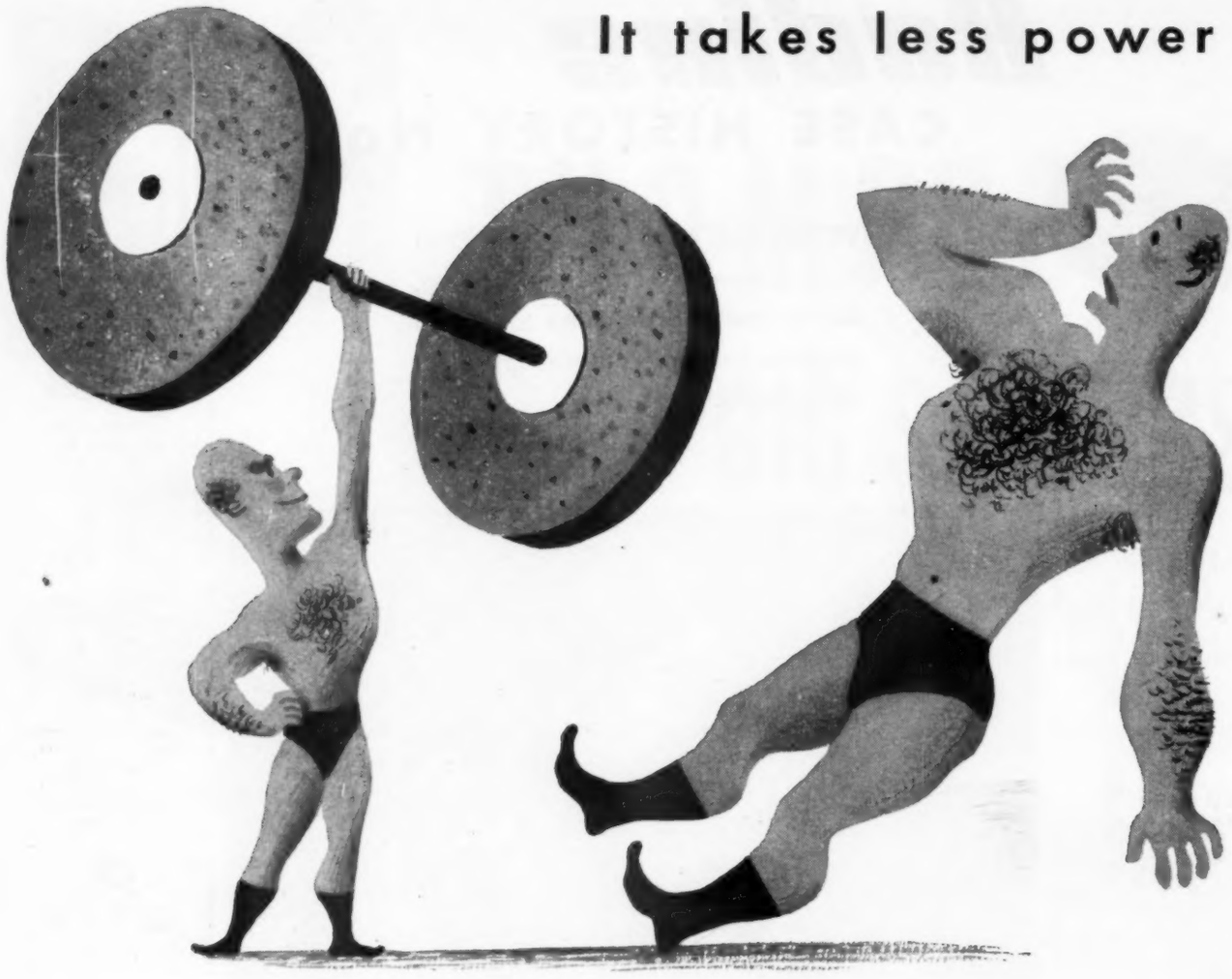
THE **Bodine** CORPORATION

BRIDGEPORT 5 CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

BBD48

It takes less power



when you use ROBERTSON WHEELS

Yes, conventional wheels will do the work . . . if you push them to the limit, allow twice as much grinding time, discount wheel wear and omit power consumption in figuring your overhead.

Again and again, Robertson open structure wheels have demonstrated their ability to double and triple production and give you a substantial bonus in decreased power-costs. Here's a good example of that ability:

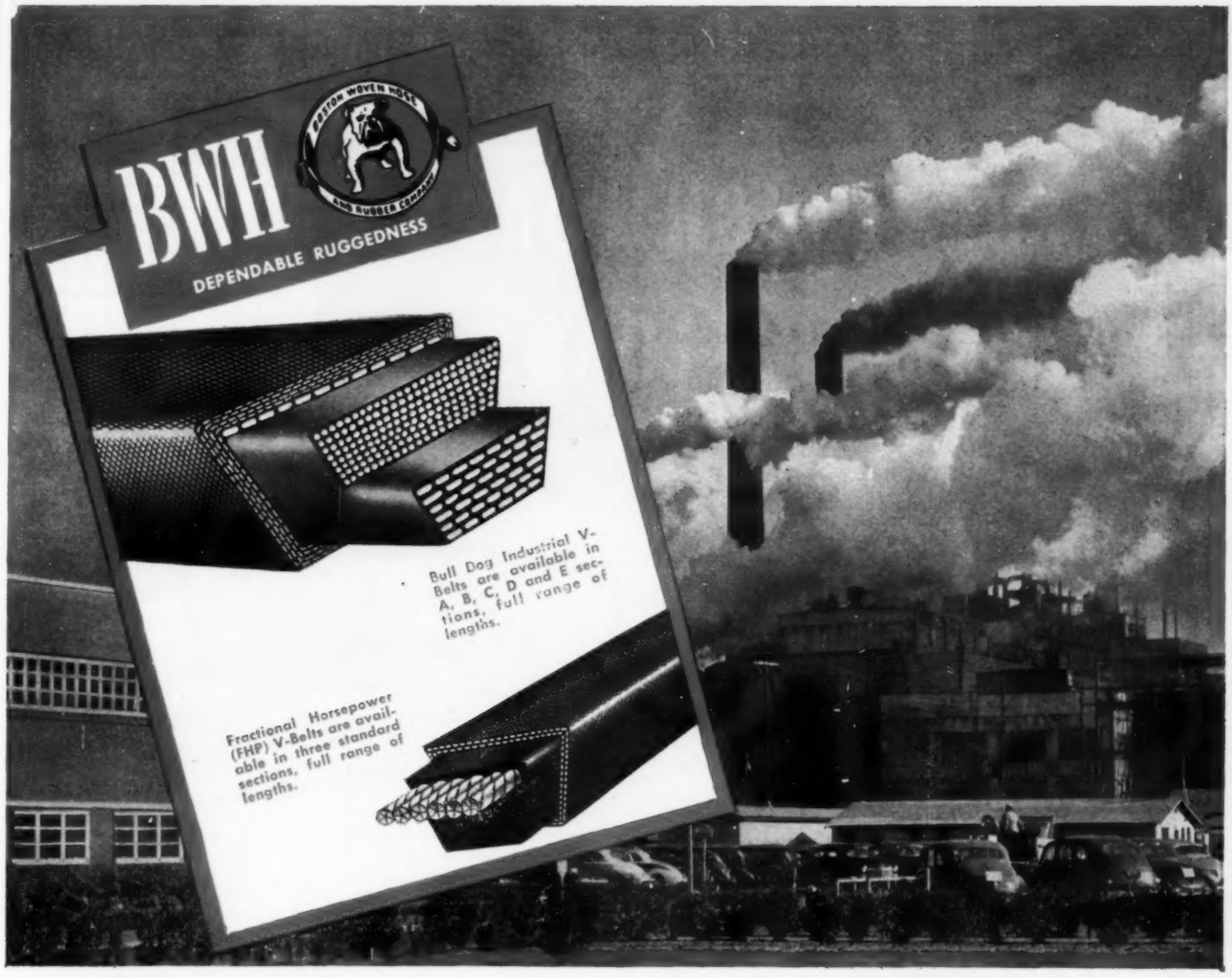
One large company, operating a Blanchard on half-inch-thick boiler plate thirty inches square and with a ten-inch hole in the center, was taking 45 minutes to remove .050″ stock from one side. Ampere reading was 55-67. When the Blanchard was equipped with a Robertson Segmental Wheel, grinding time was cut to 20 minutes (which was less than half the previous time). Feed was stepped up 25 percent. Ampere reading dropped to 45-50.

Results like these, obtained on difficult boiler-plate grinding operations, indicate the advisability of using Robertson grinding wheels to handle all your grinding work. Blueprint your grinding problems . . . and let us recommend wheels that will solve them.

ROBERTSON COOL-CUT

ROBERTSON MANUFACTURING COMPANY
TRENTON 5, NEW JERSEY

Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments


BWH
BOSTON WOVEN HOSE AND RUBBER COMPANY
DEPENDABLE RUGGEDNESS
Bull Dog Industrial V-Belts are available in A, B, C, D and E sections, full range of lengths.
Fractional Horsepower (FHP) V-Belts are available in three standard sections, full range of lengths.

HERE'S WHY ALL INDUSTRIES ARE TURNING TO

NEW BULL DOG V-BELTS

Industrial experts agree that the most important factor in improving productivity is better equipment. As a result, they're scanning new products eagerly and giving them thorough workouts. And BULL DOG V-BELTS are among the newcomers that have more than won their spurs in every trial.

It's typical of the 70-year BWH fame for precision that these V-Belts weren't put on the market till they'd been exhaustively tested in the field. BULL DOGS proved they had real tenacity. They gripped tighter, slipped less, stayed on the job longer. And here's the construction that accounts for this superior performance:

1. Exclusive Bull Dog Cord Section has higher tensile strength—able to carry the load and absorb shock.
2. Low Stretch, because exclusive Bull Dog Cords are processed in a new way. As a result there's less slippage, fewer adjustments, longer life.
3. Cool Running—thanks to quality-controlled compounds developed in BWH laboratories, which don't crack or deteriorate under severe flexing.
4. Wear-Resistant covers— made of bias-cut heavy fabric to protect heart of belt from dirt, grease, moisture.

Specify Bull Dog V-Belts on all replacements. You'll find they mean "More Power To You" every time.

HAVE YOU A JOB WHERE STAMINA COUNTS?

Bring us your toughest problems . . . we're specialists in solving them. Consult your nearest BWH distributor or write to us direct.

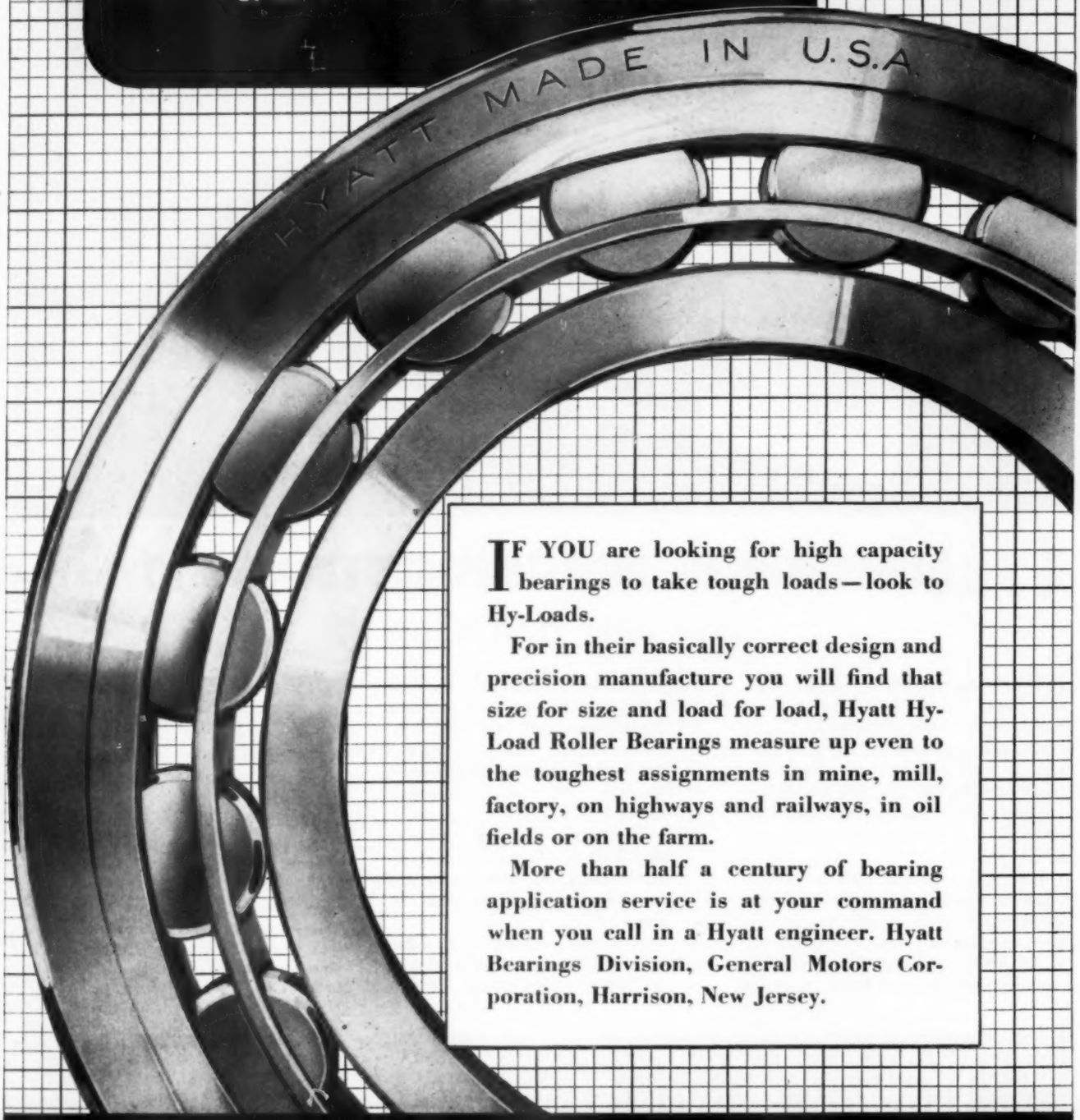
Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all principal cities

PLANT: CAMBRIDGE, MASS., U. S. A. • P. O. BOX 1071, BOSTON 3, MASS.

FOR TOUGH LOADS GET HY-LOADS



IF YOU are looking for high capacity bearings to take tough loads—look to Hy-Loads.

For in their basically correct design and precision manufacture you will find that size for size and load for load, Hyatt Hy-Load Roller Bearings measure up even to the toughest assignments in mine, mill, factory, on highways and railways, in oil fields or on the farm.

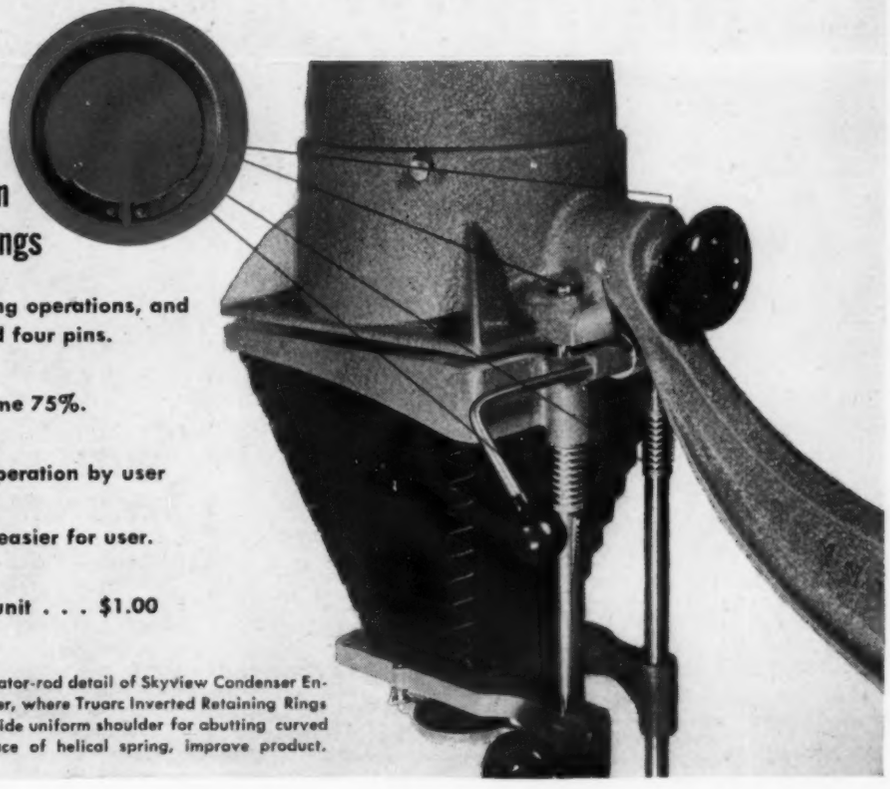
More than half a century of bearing application service is at your command when you call in a Hyatt engineer. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

Truarc inverted rings align shafts, save 20 minutes . . . . $1.00 per unit

Production savings and sales advantages result from redesign with four Truarc rings

- Eliminate two drilling, two tapping operations, and the fabrication of two collars and four pins.
- Eliminate two set screws.
- Cut dis-assembly, re-assembly time 75%.
- Make for closer tolerances.
- Make drive shaft self-aligning: operation by user greatly simplified.
- Make more delicate adjustments easier for user.
- Streamline entire unit.
- TOTAL OVERALL SAVINGS, per unit . . . $1.00



Elevator-rod detail of Skyview Condenser Enlarger, where Truarc Inverted Retaining Rings provide uniform shoulder for abutting curved surface of helical spring, improve product.

Like the Skyview Camera Company of Olmsted Falls, Ohio, re-design with Truarc and you will cut costs and improve your product too. Wherever you use machined collars, nuts, bolts, snap rings, cotter pins –there's a Truarc ring that does a better job of holding parts together. All Waldes Truarc retaining rings are precision engineered, easy to assemble and dis-assemble, retain circularity always to give you a never-failing grip. They can be used over and over again. Send us your problem. Waldes Truarc engineers will be glad to show how Truarc can help you.

WALDES

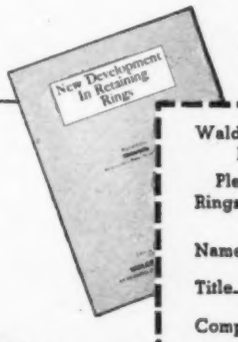
TRUARC

REG. U. S. PAT. OFF.

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS ARE PROTECTED BY U. S. PATS. 2,302,948; 2,026,454; 2,416,052 AND OTHER PATS. PEND.



● *Send for new Truarc booklet, "New Development In Retaining Rings"*

Waldes Kohinoor, Inc., 47-10 Austel Place AM-12
Long Island City 1. N. Y.

Please send booklet, "New Development In Retaining Rings" to:

Name_____

Title_____

Company_____

Business Address_____

City_____ Zone_____ State_____

THREAD AND FORM ROLLING TOOLS and MACHINES EXCLUSIVELY!

REED Cam-Actuated, Triple Die THREAD ROLLING MACHINES

REED Cylindrical and Flat THREAD ROLLING DIES

REED KNURLS

REED THREAD ROLLS

A Complete

THREAD ROLLING SERVICE

At your disposal—the skill, experience and equipment of an organization devoted exclusively to the design and manufacture of thread and form rolling tools, machines and accessory equipment. Send us specifications of your work.

REED THREAD ROLLS

Made to Specifications

Threads may be rolled on certain classes of work economically with thread rolls on screw machines. The thread rolls are mounted in special holders on the cross slide in a similar manner to knurls.

Send for General Bulletin 5-1

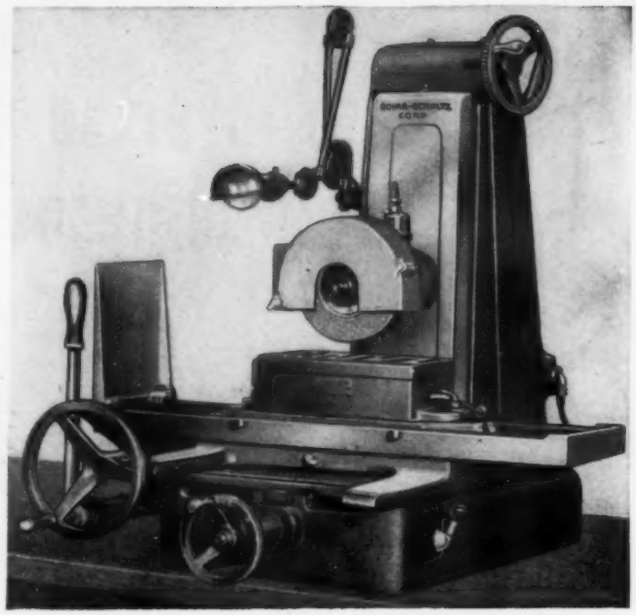
REED ROLLED THREAD DIE CO.

Manufacturers of

THREAD ROLLING MACHINES AND DIES—
KNURLS—THREAD ROLLS.

WORCESTER 2, MASS., U.S.A.

REED RTD CO



SAVE 3 *WAYS*

WITH BOYAR-SCHULTZ No. 6-12 BENCH MODEL SURFACE GRINDER

(1) *Saving in Time.* This saving alone will justify one or more No. 6-12 Bench Model Grinders installed on tool makers' benches or in convenient places in the tool room, instantly available for close tolerance grinding of the many important small jobs encountered in every shop.

(2) *Saving in Operation.* Large grinders cost more to operate, as much for the small job as for many larger jobs. Set-up time in larger machines is also a factor.

(3) *Saving in Cost.* Boyar-Schultz No. 6-12 Surface Grinder, while its capacity is nearly equal to many large machines, is priced so low that it is real economy to place one, two or three of them at strategic points in your tool room to save sending small work to large machines.

Designed to take over the tool room's smaller jobs requiring high precision grinding. Built of the finest materials and workmanship, it is sturdy, long lasting and will maintain its accuracy on all important work called upon to perform.

MODEL 6-18 PRECISION SURFACE GRINDER

Many superior features make this Boyar-Schultz Surface Grinder an outstanding performer in producing the fine finish and extreme accuracy necessary in fine gage, grinding, tool and die work as well as in some production grinding.

Its sturdy ruggedness maintains that fine accuracy for a long period of time . . . much longer than similar machines are expected to last.

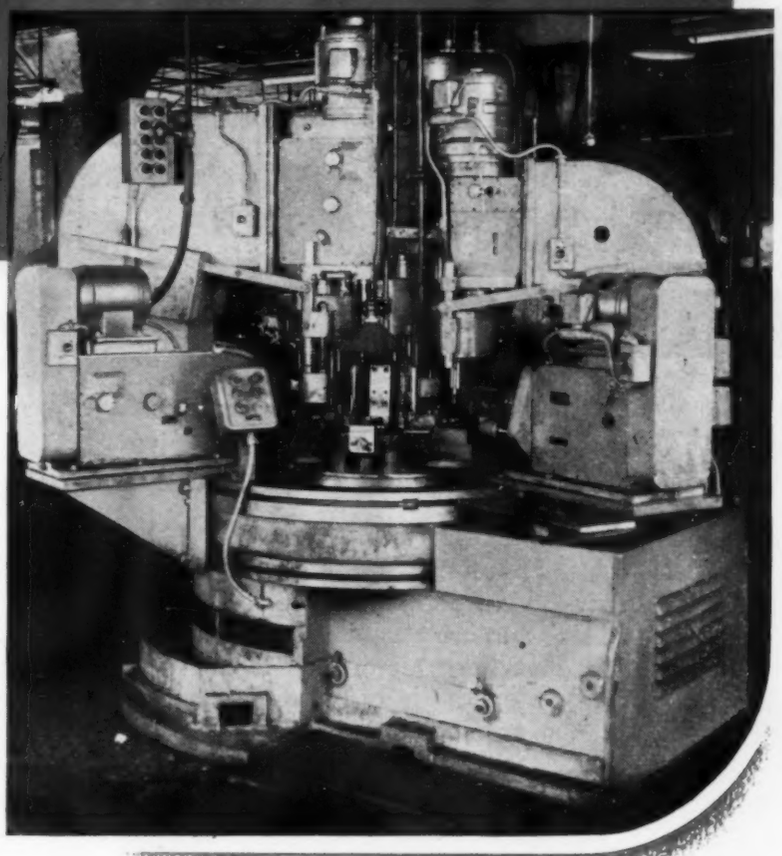
Write for Circular

BOYAR-SCHULTZ CORPORATION

2109 Walnut St. Chicago 12, Ill.

From Century's Complete Line It Was Easy to Select 7 DIFFERENT Century MOTORS

to Drive This Automatic Drill Press



The automatic drill press shown here is equipped with the following standard Century motors:

1 — one horsepower 1735 RPM horizontal motor on a cross feed

1 — one horsepower 1735 RPM vertical motor on a vertical feed

2 — one horsepower 1155 RPM horizontal motors on cross feeds

1 — one and one-half HP 1155 RPM horizontal motor on cross feed

1 — one horsepower 3500 RPM vertical motor on vertical feed

1 — two HP 1740 RPM vertical motor on vertical feed

1 — two HP 1155 RPM horizontal motor rotating the circular table

The correct Century motor for your job supplies the *right* amount of power and starting torque at the right speed combined with the *right* frame mounting and right protection from surrounding atmospheres.

Century's wide range of types and kinds of electric motors in sizes from 1/6 to 400 horsepower can simplify complicated electric power problems.

Specify Century motors for all of your electric power requirements.

Popular types and standard ratings are generally available from factory and branch office stocks.

CENTURY ELECTRIC COMPANY
1806 Pine St. • Saint Louis 3, Missouri

-600

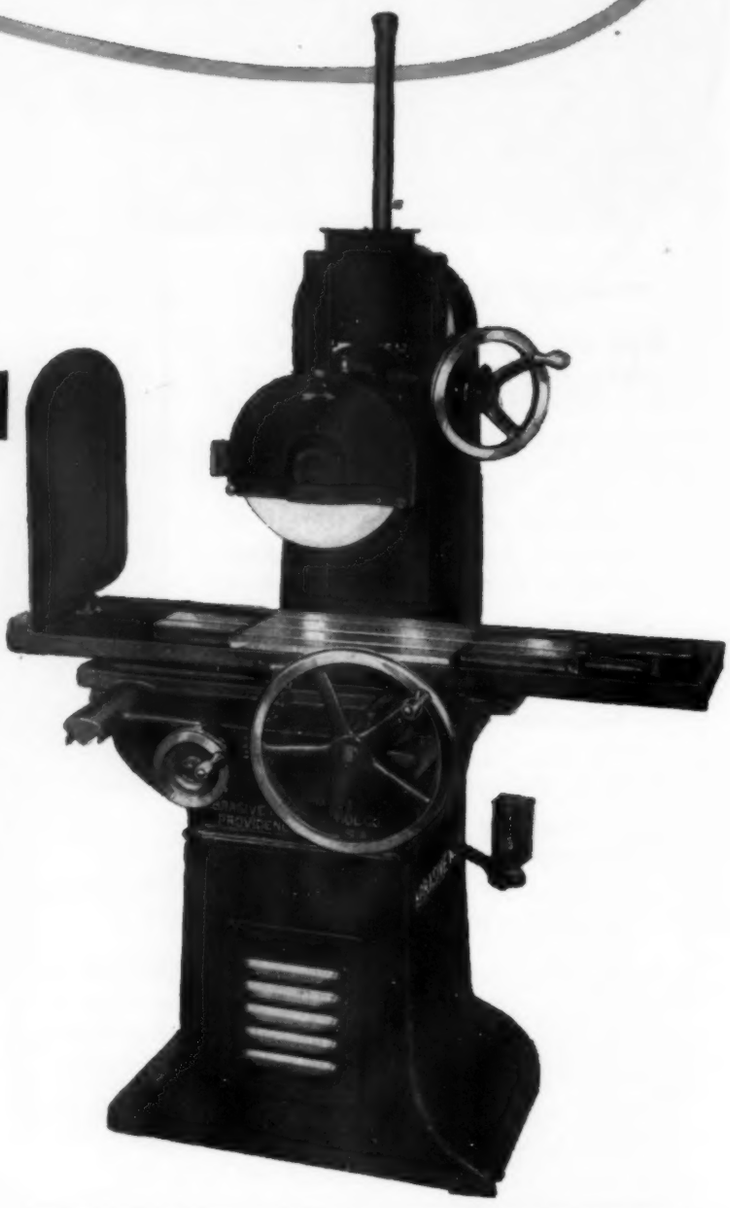
OFFICES AND STOCK POINTS IN PRINCIPAL CITIES

ABRASIVE No. 1½

Accurate and PLENTY FAST!

The Ideal Surface Grinder

for Toolrooms . . .



ABRASIVE No. 1½ is a stickler for accuracy and a glutton for work — it handles all jobs that come to your toolroom and handles them fast! Motorized spindle delivers full power directly at the grinding wheel . . . eliminates all belting. No. 1½ takes heavy cuts without vibration and produces fine, accurate finishes.

For years of economical and productive grinding service, you can rely on ABRASIVE design and precision workmanship.

Ask for descriptive bulletin.

•

SPECIFICATIONS

WORK CAPACITY — 15" long, 10" wide, 12" high
GRINDING WHEEL — Standard 12" diameter
DRIVE — 1 H.P. motor mounted on spindle
TABLE SIZE OVERALL — 48" x 11¼"
FEEDS — All hand feeds; Transverse graduated .001"; Vertical .00025". Metric graduations if specified.
NET WEIGHT — 1350 lbs.

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, RHODE ISLAND

ABRASIVE
ACCURACY BOOSTS PRODUCTION

FIRTHITE SINTERED CARBIDE,

used in your shop tooling brings

—more rapid removal of material
—increased production runs
—better finishes
—cutting of so-called unmachinable materials
—holding of closer tolerances
—longer tool and die life

. . . all of which adds up to higher production at lower costs

SEND THE COUPON

FOR LATEST CATALOG CONTAINING DATA ON

FIRTHITE SINTERED CARBIDE CUTTING TIPS, TOOLS AND SPECIALTIES

This new catalog, just off the press, contains information on the most recent developments in Firthite carbides and describes forms supplied and grades available for cutting tools, special tools and wear parts.

Your copy is ready—sign and mail the coupon.

Firth Sterling Steel & Carbide Corporation
McKeesport, Pennsylvania

Please send me a copy of your new catalog—"Firthite Sintered Carbide Tips, Tools and Specialties."

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

6

IT'S A

Mac-it®

PRONOUNCED "MACK-IT"

Mac-it Stripper Bolts—heat-treated for strength, head concentric with body, ground to close tolerances.

BETTER, FASTER SERVICE WITH THIS *COMPLETE* MAC-IT LINE!

Because many standard types of Mac-its are stocked throughout the country for quick delivery, and because specials can be engineered to your own specifications, you'll find it pays to investigate Mac-its *first.*

Mac-it's 35 years' experience in the manufacture of heat-treated, alloy steel screws is your assurance of precision, uniformity and strength. Sold through leading industrial distributors from coast to coast and in Canada. Write for new catalog today!

Other Mac-it products include:

Hollow Lock Screws	Socket Screw Keys
Socket Head Cap Screws	Square Head Set Screws
Hollow Set Screws	Hexagon Head Cap Screws
Hollow Pipe Plugs	. . . and many others

Marketed Nationally Since 1913 by

STRONG, CARLISLE & HAMMOND COMPANY

Cleveland 13, Ohio

Manufactured by MAC-IT PARTS COMPANY, Lancaster, Pa.

The SUPER METHOD

of TRIMMING FORMED PARTS

and performing a host of other metal cutting jobs!

The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind. Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.

Write for Your Free Copy

FRICTION SAWING *with* Tannewitz HIGH SPEED BAND SAWS

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

Built for continuous production

Write for full information

KAUFMAN TAPPING MACHINES

KAUFMAN MFG. CO.
Manitowoc, Wisconsin

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

LELAND GIFFORD

PRODUCTION ENGINEERS

at these Branch Offices will help you with your DRILLING PROBLEMS.

CHICAGO, ILL.
565 W. Washington Blvd.

DETROIT, MICH.
1533 Dime Bank Bldg.

CLEVELAND, O.
P. O. Box 5547

NEWARK, N. J.
Industrial Office Bldg.

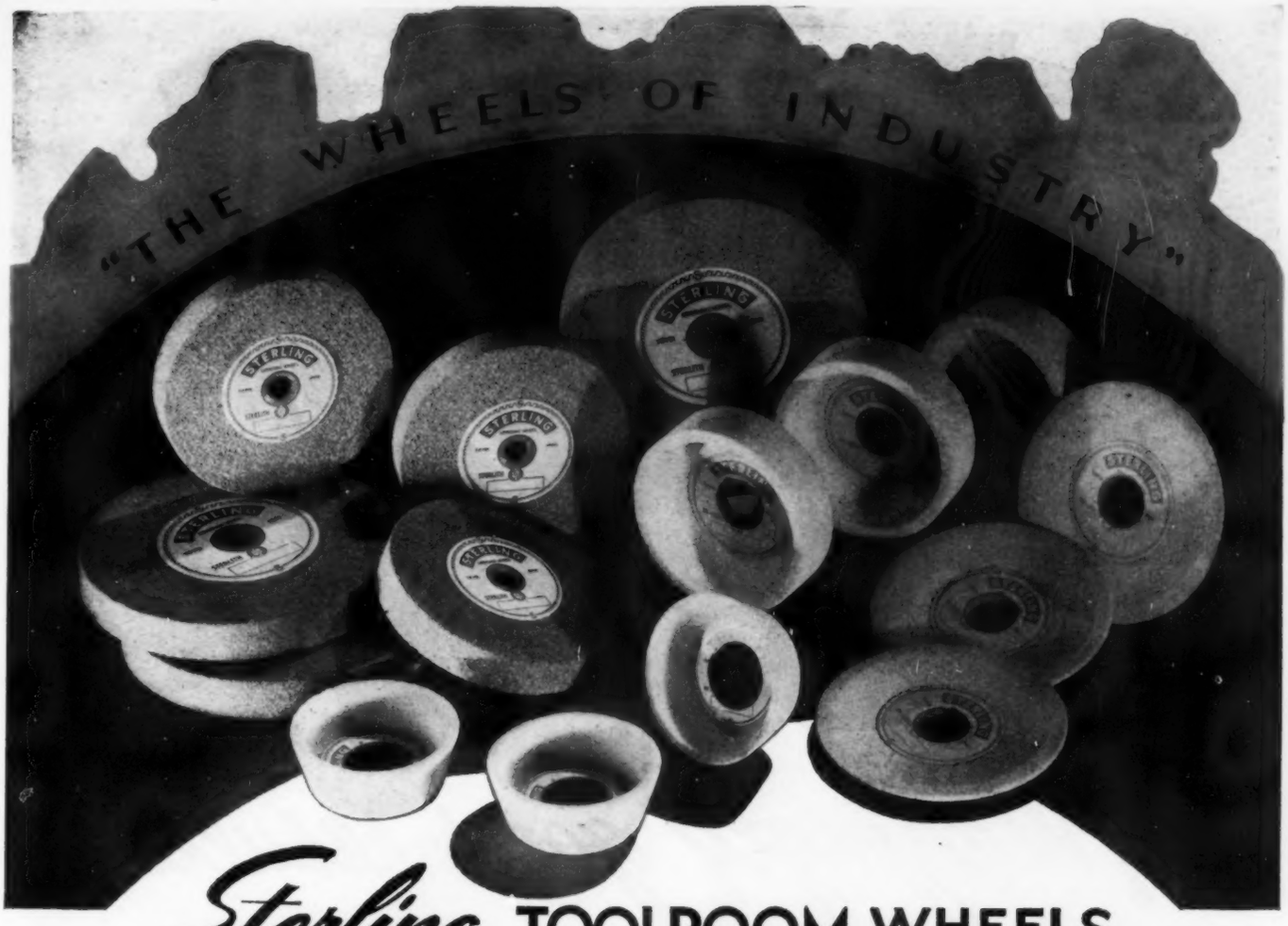
ROCHESTER, N. Y.
Commerce Bldg.

WORCESTER, MASS.
for New England

LOS ANGELES 14, CAL.
724 South Spring Street

LELAND GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.



Sterling TOOLROOM WHEELS

help change difficult jobs into easy ones

Speed up production and cut down spoilage by using the finest toolroom grinding wheels available—Sterling!

Today, toolroom grinding demands specialized wheels built to the needs of each individual job. Sterling meets this demand with wheels of proper grain size and hardness to remove stock quickly and secure desired finish.

Sterling Toolroom Grinding Wheels are used for grinding and sharpening broaches, cutters, dies, drills, gauges, hobs, reamers, cams, tools (lathe and planer), Stellite tools, etc. The smooth cutting W Sterlith grain, plus the uniform H and F bonds, does the job.

For fast cutting action on any alloy, specify the "Wheels of Industry" and be certain.

Your Best Industrial Supply Distributor Carries Sterling Wheels In Stock

Send for the Sterling Toolroom Grinding Folder it provides complete specifications for all types of jobs. It's free. Write for it.

• STERLING ABRASIVES •

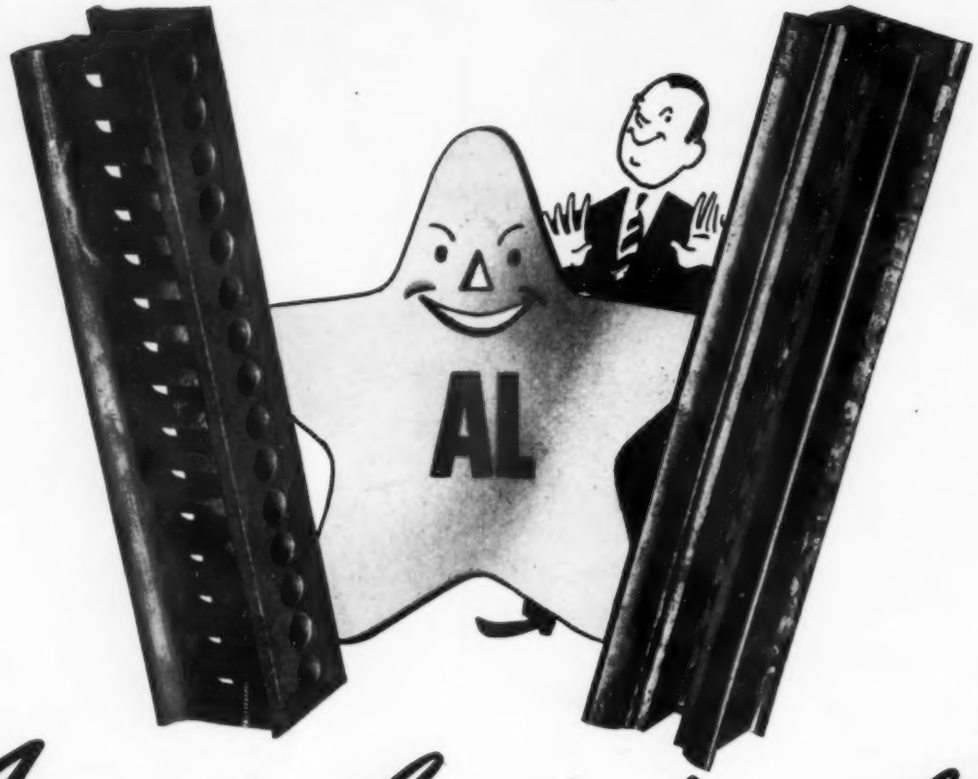
THE

STERLING GRINDING WHEEL DIVISION

OF THE CLEVELAND QUARRIES COMPANY

TIFFIN, OHIO

THE WHEELS OF INDUSTRY



"Amazingly good results"
(SAID THE USER)

from this Gang Milling Fixture made of AIRLOY

There's an A-L Tool Steel to do each job best!

★

The Allegheny Ludlum Tool Steel family includes 37 principal types, covering the high speed, hot work, shock resisting, cold die, and carbon and low alloy steel fields. Let us help you find the best answer to *any* problem that occurs in your production or use of cutting and forming tools.

Address Dept. AM-80

Particularly in view of the way it is cut up, the fixture shown above—made of A-L "AIRLOY" (a manganese-chrome-molybdenum air hardening cold die steel)—gave a performance that delighted the user, *and that's what counts!*

The fixture was designed to hold 15 small parts, 1/2" x 3/8", for milling a slot. In heat treatment, each fixture was first preheated at 1150° F., then raised to 1475° F. and held there for 7 to 8 minutes, then air cooled—resulting in a hardness of 62/63 Rockwell C. After a draw at 500° F., the final hardness was 57/58 C. Accurate measurement before and after heat treating revealed that there was *no change in sizes.*

AIRLOY is just one of eight principal types of A-L Cold Die Steels—hardenable from low temperatures, insuring low scale loss and freedom from cracking and distortion. One of these types can help you, and our Technical Staff is always at your service—no obligation.

ALLEGHENY LUDLUM STEEL CORPORATION
Pittsburgh, Pa.

TOOL STEEL DIVISION: DUNKIRK, N. Y.

Fine Tool Steels Since 1854 W&D 1780

These Bolts are covered with grime

These Bolts are loaded with burrs

These Bolts are clean and smooth

Circle Ⓑ Bolts and Nuts . . . both standard and special . . . are produced by skilled boltmakers with years of experience. This is reflected in the finished appearance as well as the overall quality of these famous products.

BUFFALO BOLT COMPANY

North Tonawanda, N. Y.

SALES OFFICES IN PRINCIPAL CITIES

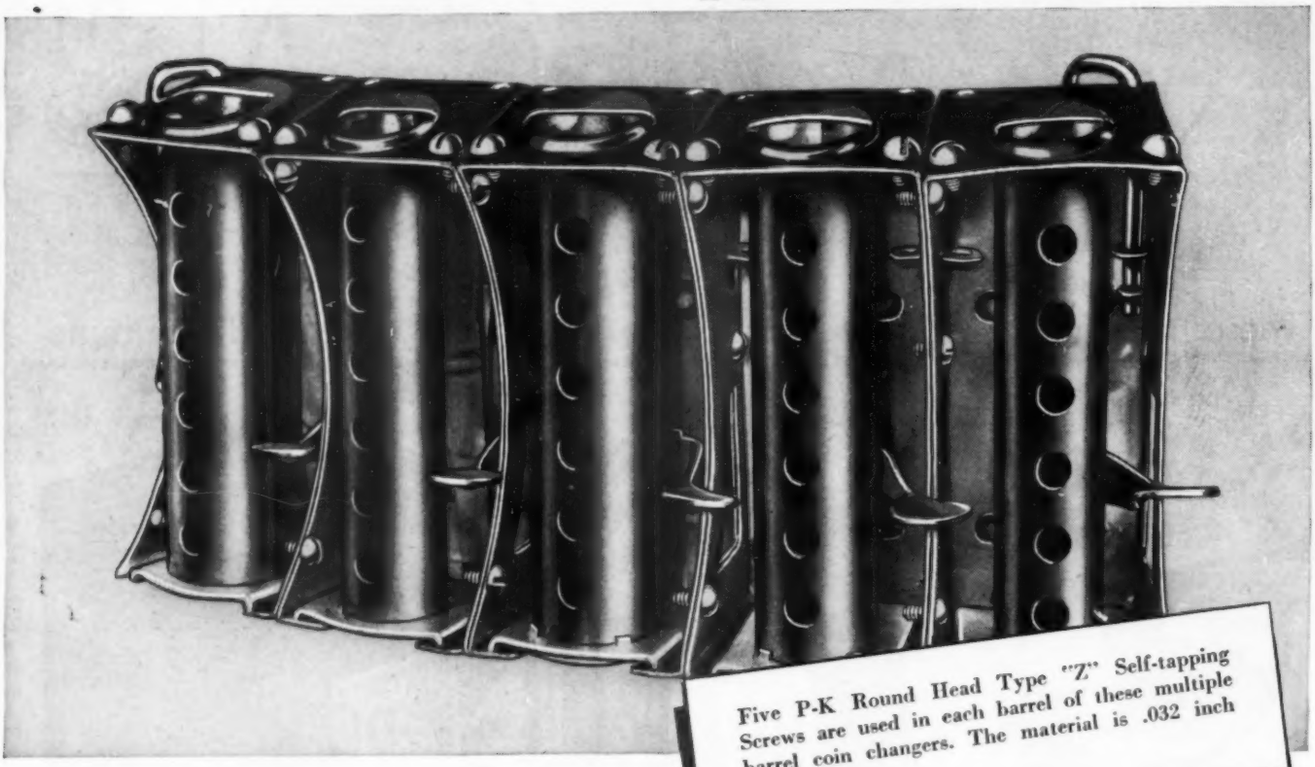
Export Sales Office · Buffalo International Corp., 50 Church Street, New York City

...they are CIRCLE Ⓑ BOLTS

COMMON SENSE ASSEMBLY ENGINEERING

MAKES THE "RIGHT CHANGE"
...SAVES 40% IN WORK-HOURS

... avoids tapping 22 holes



Five P-K Round Head Type "Z" Self-tapping Screws are used in each barrel of these multiple barrel coin changers. The material is .032 inch sheet steel.

With today's high wages, a 40% saving in assembly work-hours is a change well worth making. And that's why Meyer & Wenthe, Inc. switched to P-K Self-tapping Screws in the assembly of their barrel coin changer.

Screws were necessary, because at times the coin changers must be taken apart and reassembled to relocate various coin units. And since P-K Screws eliminated the extra operation of tapping 5 holes in each barrel unit, they were the logical choice. Assembly was started several steps closer to the finished job and tap expense, tap breakage, and misalignment troubles were avoided. That's common sense in any industry.

If you are being "short-changed" on the assembly line by work-slowing operations, such as tapping, riveting, nut running, or inserts in plastic . . . investigate the simpler P-K method. On seven out of ten jobs, P-K Self-tapping Screws make possible savings up to 50%. At the same time, P-K Screws often make possible improvements in product design.

The odds are with you . . . call a P-K Assembly Engineer and see if you are one of the "lucky seven". If you prefer, mail assembly details for recommendations. Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

Sold Only Through Accredited Distributors

P-K® The Original

A TYPE AND SIZE FOR EVERY METAL AND PLASTIC ASSEMBLY

PARKER-KALON SELF-TAPPING SCREWS

PARKER-KALON PRODUCTS COLD-FORGED SOCKET SCREWS, WING NUTS, THUMB SCREWS • HARDENED SCREWNAILS AND MASONRY NAILS
SHUR-GRIP FILE AND SOLDER IRON HANDLES • METAL PUNCHES • DAMPER REGULATORS AND ACCESSORIES

CMC
CLEARING
MECHANICAL & HYDRAULIC

Above: CLEARING 3000 TON CRANKLESS PRESSES making rails for automobile chassis.

Right: CLEARING 75 TON GAP FRAME PRESSES in a large appliance plant.

LARGE OR SMALL—

THEY SPELL ECONOMY

Thirty-foot rails for bus frames or parts for a household appliance — Clearing presses turn them out swiftly and completely, ready for assembly with no labor costs for grinding, drilling or other subsequent operations. Because Clearing presses deliver accurately formed work, assembly is smooth and rapid. No wonder that production costs are driven down.

Equally important, Clearing affords unique features of design and construction which yield longer die life, with fewer interruptions to production for die repair or regrind. Every production man knows what these items mean on a cost sheet.

Whether you need 60 tons capacity or 3,000 tons or more, Clearing can furnish a press that will produce for you with maximum economy when all factors are taken into account. That's a plain, straightforward statement. We'd like to have you make us prove it.

CLEARING MACHINE CORPORATION • 6499 West 65th Street • Chicago 38, Illinois

CLEARING

THE WAY TO EFFICIENT MASS PRODUCTION

CMC
CLEARING

ELIMINATE FULLERING AND EDGING OPERATIONS!

You can now replace costly fullering and edging operations by fast, simple rolling on the new National Reduceroll.

Shown above at the right of the Reduceroll are typical examples of pre-formed forging blanks, ready for impression die forging on the same heat.

Advantages of the Reduceroll are:

1. Increased production.

2. Unskilled operation.

3. Metal distributed accurately—minimizing flash.

4. Die life increased.

5. Uniform blanks free of shuts and folds.

6. Versatility—increases the range of your forging equipment.

7. Ruggedness—for large reductions in area.

8. Portability—for use as a "roving" tool.

9. Low-cost rolls quickly interchangeable.

Why not let us help you investigate the application of Reducerolling to your forging jobs?

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF
MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET AND WIRE NAIL MACHINERY

New York Detroit Chicago

BUILT OVERSIZE FOR
STRENGTH AND RIGIDITY

Complete oversize construction of Defiance No. 26 Horizontal Mill insures outstanding ruggedness and precision . . . absorbs vibration! Defiance builds the only horizontal boring mill having outboard bearings an integral part of the machine, thus eliminating worry as to accuracy of supports.

Experienced shop men find Defiance Mills *built right* in rigidity and strength . . . with thoroughly practical features and dependability to "keep 'em producing" and minimize expensive down time. Write for bulletin. Defiance Machine Works, Inc., 2325 Madison Ave., Toledo 2, Ohio.

98 YEARS OF PRECISION MANUFACTURE

DEFIANCE

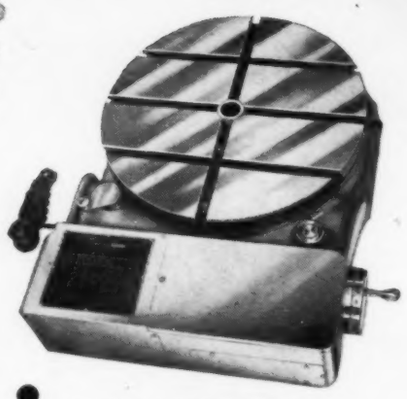
BORING . . . MILLING . . . DRILLING AND TAPPING MACHINES

NEW!

KNIGHT EQUIPMENT
. . to Boost Output and Lower Costs

No. 50 PRECISION BORING AND VERTICAL MILLING MACHINE

Adaptable to an extreme variety of difficult jobs. Eliminates work transfers, reduces set-up time to a minimum. Combines advantages of both a solid base precision boring machine and rigid vertical miller. Unusual capacity. Fast and simple operation.



20" ROTARY TABLE

A self-contained motor-driven unit which adapts any milling machine for rotary milling or indexing. Eliminates set-up time. No installation — just plug into electric outlet. 18 Feed changes, 1½" to 54" or 3" to 108" per minute.

HOLE GRINDING ATTACHMENT

Accurately and quickly finishes holes and bores up to 6" diameter in hardened parts. Simplifies handling work too large to swing in standard machines. Special adaptors permit easy installation on any milling machine.

ELECTROMILL

Efficiently, economically handles large capacity work of many types: jigs, metal patterns, multi-cavity molds, jig boring with dial indicator, drilling, milling, machining light metals, etc. Infinitely variable range of speeds and feeds. Any combination of speeds and feed controls can be supplied or eliminated subject to customers requirements.

Write Today
for details and specifications

KNIGHT VERSATILE MILLERS ACCURATE RIGID

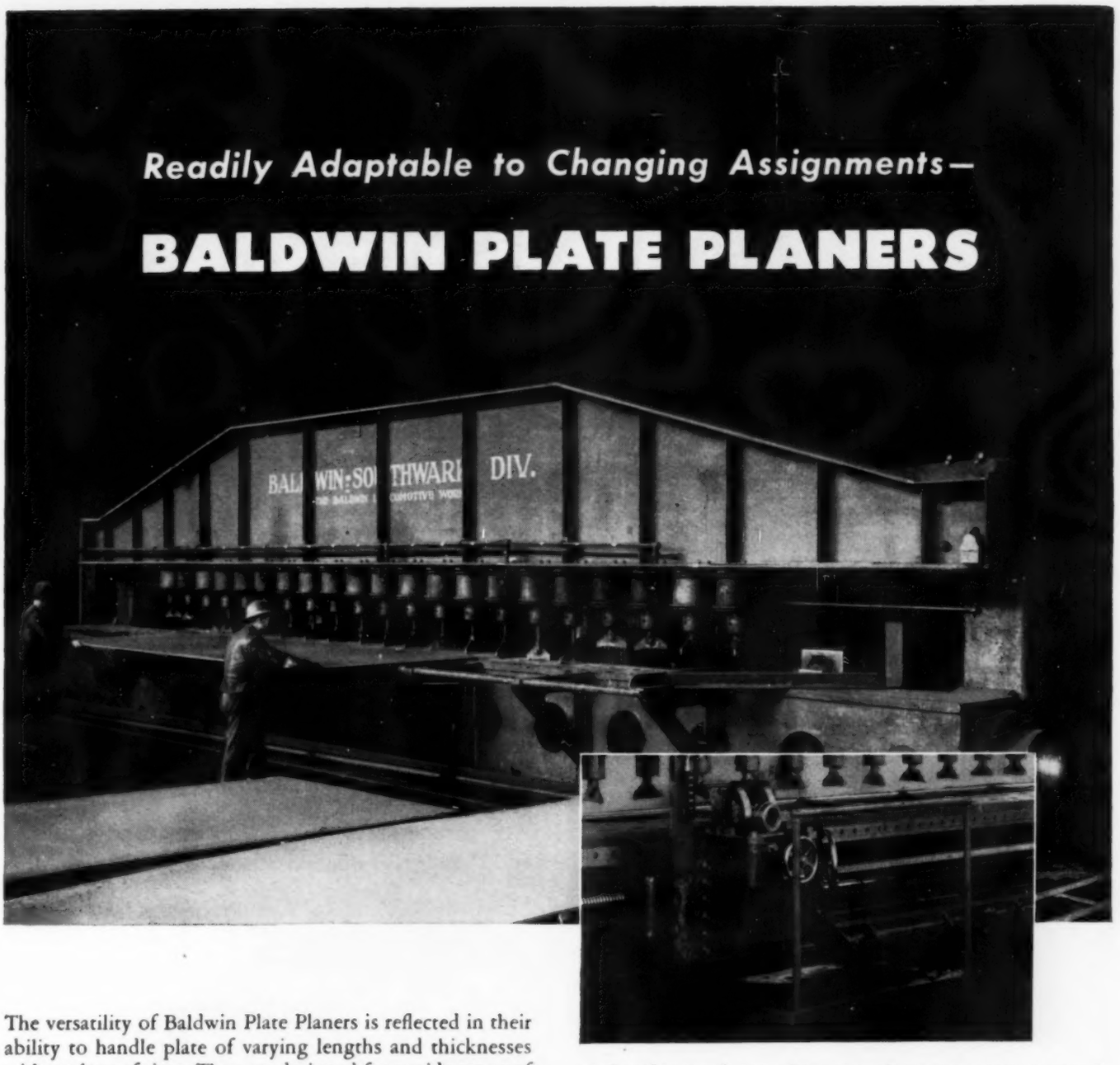
W.B.KNIGHT
MACHINERY COMPANY

MORE GOODS for MORE PEOPLE at LOWER COST

3920 WEST PINE BLVD. • ST. LOUIS 8, MISSOURI

Readily Adaptable to Changing Assignments—

BALDWIN PLATE PLANERS



The versatility of Baldwin Plate Planers is reflected in their ability to handle plate of varying lengths and thicknesses without loss of time. They are designed for a wide range of work making it possible to pay off the investment in a minimum length of time.

FOR CONTINUOUS PRODUCTION OR GENERAL FABRICATION

These planers are star performers on continuous production jobs, such as large pipe or standard tank work—and on run-of-mill jobbing shop operations. User experience covers both assignments, and completely confirms the ability of the planers to do *many* jobs *well*.

IMPORTANT FEATURES

Notable design features that give Baldwin Plate Planers versatility, efficiency, and sustained precision include individual or group control of all work-clamping cylinders; shielding of carriage-screw from dirt, scrap, or dropped tools; gap frame housings that permit entry of the work from either end without undue handling; anti-friction thrust bearings that absorb tool thrust; continuous lubrication of thrust bearings and other vital parts; oil bath for enclosed gears; longer than normal carriage screw to permit over-run in the event of electrical failure; main operating controls always within operator's reach from his carriage mounted platform and a drive design which keeps the screw in tension while the plate is being planed.

ASK FOR INFORMATION

Other features, such as added safety controls, more elaborate controls, various types of carriages, and special plate-handling equipment, are available on specification. Bulletin 190 will give you some helpful information. Write for it. The Baldwin Locomotive Works, Philadelphia 42, Pa., U.S.A. Offices: Boston, Chicago, Cleveland, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Seattle, St. Louis, Washington.

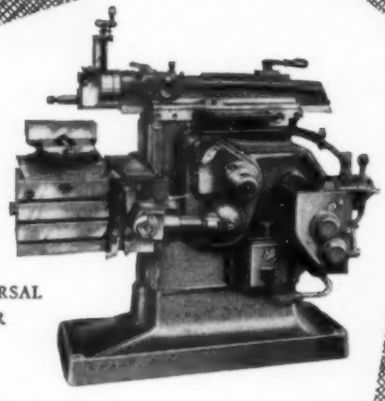
BLW THE BALDWIN GROUP

BALDWIN
POWER TOOLS

A KNOTTY PROBLEM?

. . . not when you have a Hendey 12" Universal Hi-Speed Shaper in the plant! This unusually versatile shaper machined an ordinary hex bar into the multi-facet form, above, *in a single setting of the work in the vise.* You may not wish to cut such shapes, but you do want to eliminate expensive set-up time. With a table that can tilt to any angle, the Hendey 12" Shaper reduces set-up time to a minimum. Add to this its ability to remove metal faster and more accurately and you have a perfect combination of cost-saving features that are worth investigating.

Have you any knotty shaping problems? . . . Better write for full details on the Hendey 12" Hi-Speed Shaper today.



HENDEY 12" UNIVERSAL
HI-SPEED SHAPER

Other Hendey Machines Include
Tool Room Lathes — 9"- 12"- 14"- 16"- 18"- 20"- 24"
Shapers — 12"- 16"- 20"- 24"- 28"

THE **hendey** MACHINE COMPANY

MAIN OFFICE & PLANT: TORRINGTON, CONN.

BRANCH OFFICES: New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco

REPRESENTATIVES: Philadelphia, Cleveland, Pittsburgh

hendey

Another New GEARGRIND-

with Greater LENGTH CAPACITY

TYPE GG-10 x 48A WITH AUTOMATIC WHEEL FEED

This is a combination spline and gear grinding machine, handling both involute and square key splines and work up to 48″ long. The illustration shows it equipped with the Geargrind spline trueing device. The wheel trueing device for use with gears is shown in the insert.

If you have work within the capacity range shown below, write for complete specifications and catalog.

CAPACITY:

Takes between centers	Up to 48″
Gear diameter	¾″ R.D. to 10″ O.D.
Maximum swing	12½″
Number of teeth	4 to 120
Face width	Up to 34″
Diametral pitch	32 to 4

(For other diametral pitch requirements, consult our engineering department)

FORMED WHEEL GRINDING

There is no "distortion from heat treat" when you use the Formed Wheel Method of grinding external and internal gears, external and internal involute splines, straight splines, serrations and racks.

Geargrind Machines—in many styles and capacities—insure accuracy, fine finish and speed in production.

Catalog on Request

The GEAR GRINDING MACHINE COMPANY

DETROIT, MICH., U.S.A.

MERRY CHRISTMAS . . . HAPPY NEW YEAR

Season's Greetings

To our customers and friends we wish a Merry Christmas with the sincere hope that its joy and gladness may be but the forerunner of a New Year of golden days rich with happiness and health, success and content.

☆

THE WELDON TOOL CO. Cleveland 4, Ohio
3000 WOODHILL ROAD

This beats a magic carpet!

Air Express can bring you supplies and equipment from any U. S. point—*overnight*. And that's better than old-style magic! Air Express is the fastest way you can find to ship or receive. No delays, because shipments go on every flight of the Scheduled Airlines.

What's more you get special door-to-door service at no extra cost. With low Air Express rates, you can use this fastest service as a regular procedure. Let Air Express keep your business running fast—and smoothly.

Specify Air Express-World's Fastest Shipping Service

- Low rates—special pick-up and delivery in principal U.S. towns and cities at no extra cost.
- Moves on all flights of all Scheduled Airlines.
- Air-rail between 22,000 off-airline offices.

True case history: Rubber equipment users regularly get replacement parts by Air Express so machines won't stand idle. Recent shipment: 102-lb. carton picked up 5 P.M. the 18th in Noblesville, Ind. Air-rail to Dallas, delivered 9 A.M. following day. 799 miles, total cost only $26.78. Any distance inexpensive, too. Phone local Air Express Division, Railway Express Agency, for fast shipping action.

AIR EXPRESS
GETS THERE FIRST

Rates include pick-up and delivery door to door in all principal towns and cities

AIR EXPRESS, A SERVICE OF RAILWAY EXPRESS AGENCY AND THE
SCHEDULED AIRLINES OF THE U. S.

DROP FORGINGS *Flying Faster Than Sound*
Demand Hammers of UTMOST PRECISION

ERIE HAMMERS . . . steam drop, board drop, double and single frame forging, air and pneumatic . . . products of over 50 years design and building "know how" . . . These meet the highly specialized demands for modern jet airplane engine forged components. Experienced hammer gangs using Erie Hammers turn out turbo jet parts of exactly the desired shape and tolerance, and improve the physical properties of the metal *in the exact degree specified.* Perfect die alignment is maintained at all times in Erie Hammers. Sensitivity of control . . . Power in the exact degree to meet physical property specifications . . . These qualities in Erie Hammers contribute vastly to perfect turbo super charger forgings. All parts in Erie Hammers subject to impact . . . anvils, frames, upper works are steel.

Write for bulletins giving full details.

ERIE FOUNDRY COMPANY • ERIE, PA.

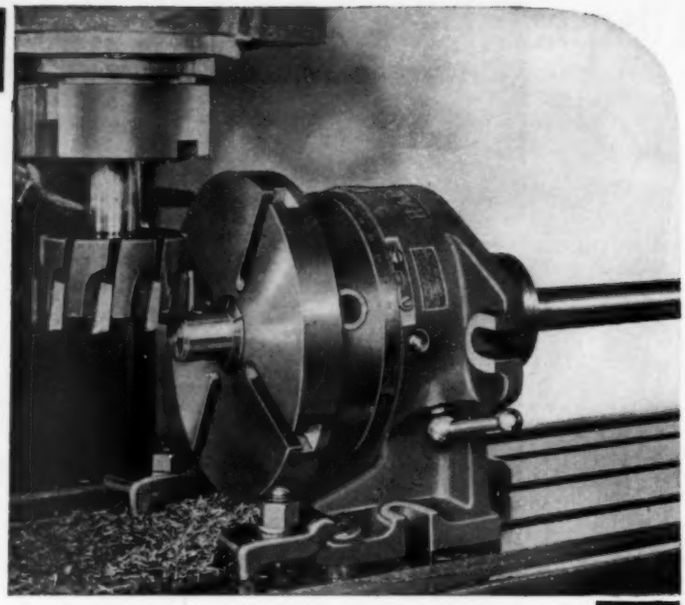
ERIE BUILDS *Dependable* **HAMMERS**

SUPER-SPACER

FOR

MILLING

The uses of the Super-Spacer in horizontal and vertical milling operations are unlimited. Here the Super-Spacer, mounted with a face plate and draw-in collet combination, shows its adaptability for milling bar stock. Investigate your present milling methods and see if your shop can't profit by the speed and accuracy of the Super-Spacer. For complete details write Dept. S2.



SPECIAL MACHINERY

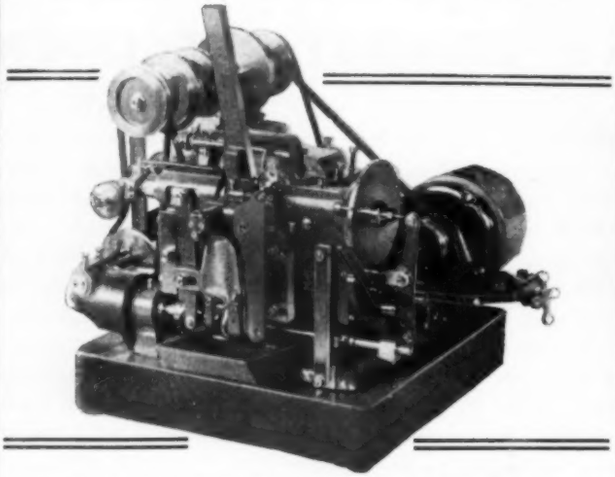
HARTFORD SPECIAL is equipped to build from prints almost any type of special machinery, parts or operations. Our facilities give your shop an added capacity. Bulletin E-200 gives complete list of our Machinery Equipment and capabilities. We'd be glad to send you one.

HARTFORD Special

THE HARTFORD SPECIAL MACHINERY CO. HARTFORD 5, CONN.

WALTHAM

PINION AND GEAR CUTTING MACHINES



Fast, Convenient, Compact, Accurate

Designed to make high speed production of small gears and pinions available for assembly in watches, instruments, gauges, fuses, etc. Made in Single-Cut, Multiple Cut and Magazine-Feed types. Simple to operate; require no special skill.

Send for detailed information and complete specifications.

WALTHAM MACHINE WORKS

Waltham, Mass.

Famous for

- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads. Insert Chaser Die Head, Threading Machines.

H&G DIE HEAD

See our Advt. on Page 280 Dec. 2, '48 American Machinist

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn. Pacific Coast Representative: *A. C. Behringer, 334 N. San Pedro St., Los Angeles California.* Canada: *F. F. Barber Machinery Co., Toronto, Canada.*

LUERS

Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By

J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.

Produced under License Issued by John Milton Luers Patents Inc.

ALMOND DRILL CHUCKS

Maximum Gripping Power with Extreme Accuracy and Long Life

Write for Catalog

T. R. ALMOND MFG. CO.

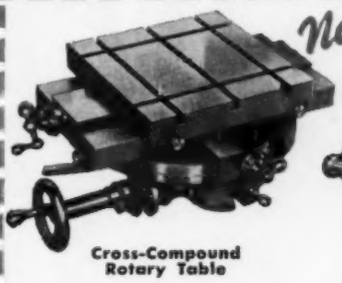
Ashburnham, Mass., U.S.A.

FREE Bulletins NOW AVAILABLE on the latest GORTON TRACER-CONTROLLED MACHINE TOOLS

2 and 3-Dimensional Pantographs for light milling and engraving; Vertical, Horizontal, Universal Milling Machines; Die and Mold Duplicators; automatic lathes for precision turning of long, slender parts; Universal Cutter Grinders and other precision small tools and accessories.

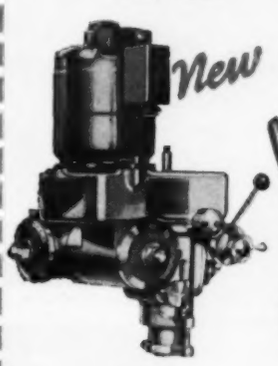
P-13 Ratiobar 3-dimensional Pantograph

3-U 2-dimensional Pantograph



Cross-Compound Rotary Table

Multi-Spacer Indexing Fixture

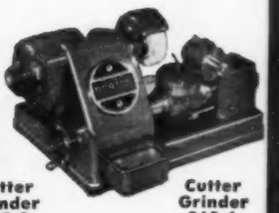


Unimill Universal Head

Double-Duty Toolgrind

3-L 3-dimensional Pantograph

3-Z 2-dimensional Pantograph



Cutter Grinder 375-2

Cutter Grinder 265-6

Free Bulletin No. 1580. Gives a complete account of the Gorton Pantograph Machines shown on this page. You can have this bulletin at once by asking for it today.

Free Bulletin No. 1317 will give you valuable information on the complete line of Gorton time-saving small tools and accessories. It will pay you to make use of this bulletin. Send for it today.

Gorton Engineering Service — For Special Assistance in Solving Difficult Metal Removal Problems. Write — Gorton Engineering Service.

For information on the complete Gorton line — 12 fact-packed pages all within a single cover — send for the new Gorton Condensed Catalog No. 1655.

For complete information on Gorton Pantograph Machines or Gorton Time-Saving Accessories, write for the bulletins listed above.

GEORGE GORTON MACHINE CO.

1512 Racine Street, Racine, Wisconsin, U.S.A.

Goss & De Leeuw

THE WORLD'S FINEST MULTIPLE SPINDLE
Chucking Machines

GOSS & DE LEEUW MACHINE CO.
KENSINGTON, CONN.

It takes more than "SAY-SO" to make a "BRALE" Diamond Indenter

As sole manufacturer of the genuine "ROCKWELL" Hardness Tester and originator of the universally accepted ROCKWELL Hardness scales, Wilson holds a deep *responsibility*. Every product bearing a Wilson name *must* have accuracy that approaches perfection. And "BRALE" is a Wilson name.

Remember, an inaccurate hardness test is worse than no test at all as it will pass defective material and reject good material. All the accuracy in your "ROCKWELL" Hardness Tester is lost if inferior penetrators are used. Keep in mind that one point of hardness on the Rockwell Scale represents a depth of only 0.00008".

WILSON
MECHANICAL INSTRUMENT CO., INC.
AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.
230-B Park Avenue, New York 17, N. Y.

ACCO

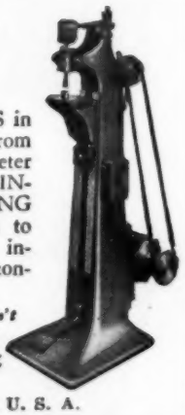
HYDRAULIC PRESSES
30 to 1,000 Ton—Built to Order
Write for illustrated catalog
M & N MACHINE TOOL WORKS, INC.
152 ORONO ST. CLIFTON, N. J.

60 YEARS MANUFACTURING
Multiple Spindle Drilling and Tapping Machines — Automatic Drilling and Tapping Units — Multiple Spindle Attachable Drill Heads—Hot and Cold Swaging Machines—Hammering Machines — Tools, Jigs & Fixtures — Contract Work — Special Machinery
LANGELIER MANUFACTURING COMPANY,
PROVIDENCE 7, RHODE ISLAND

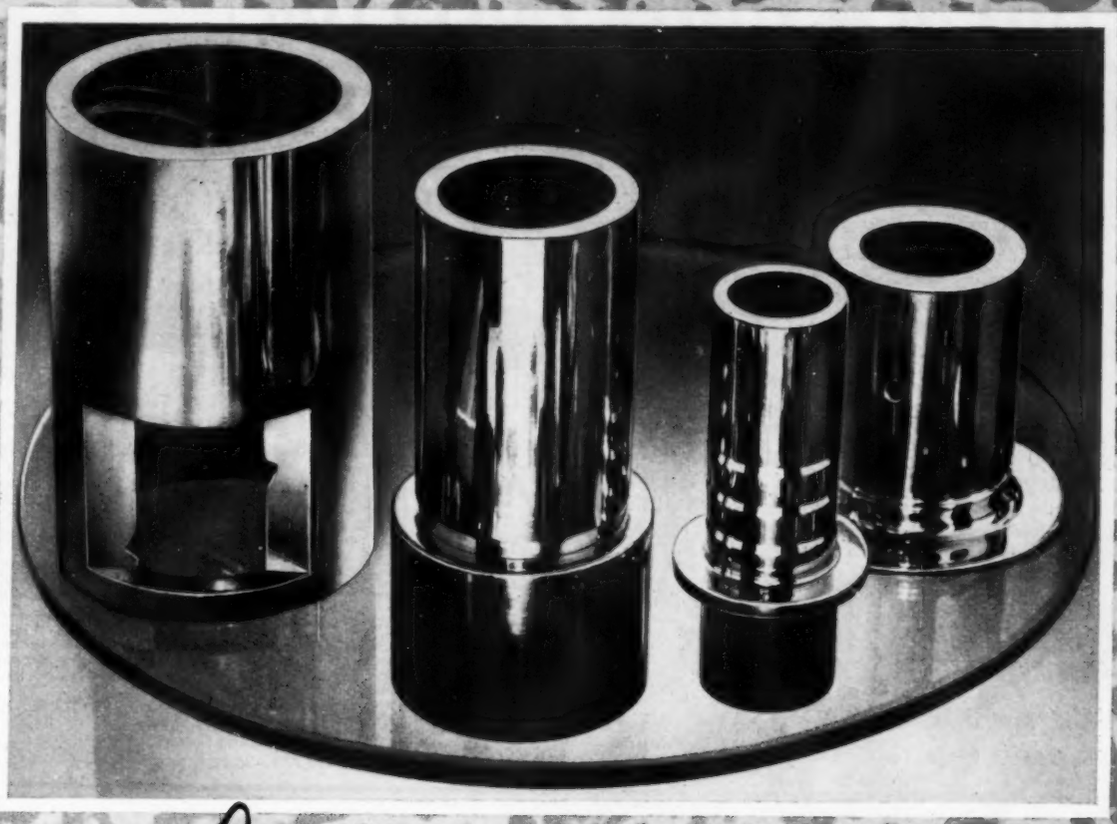
GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.



If noise is one of your problems, consider the sleeve bearing. The oil film operates silently and insulates against noise transmission. Bunting engineers will gladly discuss specific applications with you. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in principal cities.

Bunting

BRONZE BEARINGS ☆ BUSHINGS ☆ PRECISION BRONZE BARS

31

Again NEW, LOWER PRICES FOR EVANS ANTI-FRICTION DIE SETS

This third recent major price reduction is a prompt reflection of lower manufacturing costs.

Your enthusiastic acceptance of EVANS Anti-Friction Die Sets has allowed us to step-up production schedules and add more time-saving machine tools. We've been able to cut costs on our latest model—and, in the American tradition, pass our savings along to you.

The new EVANS ACROLEX Die Set gives you all the advantages of anti-friction construction: increased die life . . . faster, more accurate production . . . greater economy.

Write today for your new price list and specifications for EVANS ACROLEX and MICROLEX Anti-Friction Die Sets. At their new, lower prices, ACROLEX Anti-Friction Die Sets are more than ever the best value your dollar can buy.

EVANS

REAMER AND MACHINE COMPANY

South Main Street, New Lexington, Ohio

Preloaded anti-friction bearings between leader pins and bushings hold punches and dies in perfect alignment. And, they allow sets to open and close freely and easily . . . save assembly and try-out time . . . cut costly downtime.

Licensed under the inventions of Guy Connor. U. S. Patent Nos. 2,422,774—2,422,775

THE SOLUTION TO YOUR MILLING PROBLEMS

SEND FOR THIS FREE FOLDER

LEARN HOW...

to increase your production

to reduce your milling costs

BEMIS & CALL COMPANY

Springfield • Mass.

MAIL COUPON TODAY

BEMIS & CALL COMPANY
170 Main Street, Springfield, Mass.

Send me free folder giving detailed information about the Milmaster "that converts one machine into a tool shop."

COMPANY_____

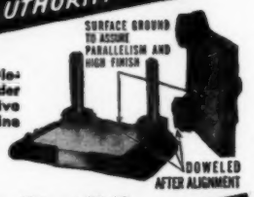
YOUR NAME_____

ADDRESS_____

CITY_____ STATE_____

BAUMBACH *The* DIE SET AUTHORITY

All Baumbach Die Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.



E. A. BAUMBACH MFG. CO., 1804 S. Kilbourn Ave., Chicago 23, Ill.

PRESSES
FEEDS
AUTOMATIC EQUIPMENT
THE V & O Press Co.
HUDSON N Y

If you operate a press room find out about *Littell* REELS

Speed up your blanking and cupping. Littell Reels use time-saving, money-saving coil stock. No lost motion for continuous insertion of sheet stock. Less scrap. Automatic work possible.

Littell Reels are self-centering for smooth feeding. They never overrun. Adjustable heads. Quick loading. Send for full details on the Littell line.

F. J. LITTELL MACHINE CO.
4169 Ravenswood Avenue
CHICAGO 13, ILLINOIS

NOT A CLAIM . . .
BUT A PROVEN FACT

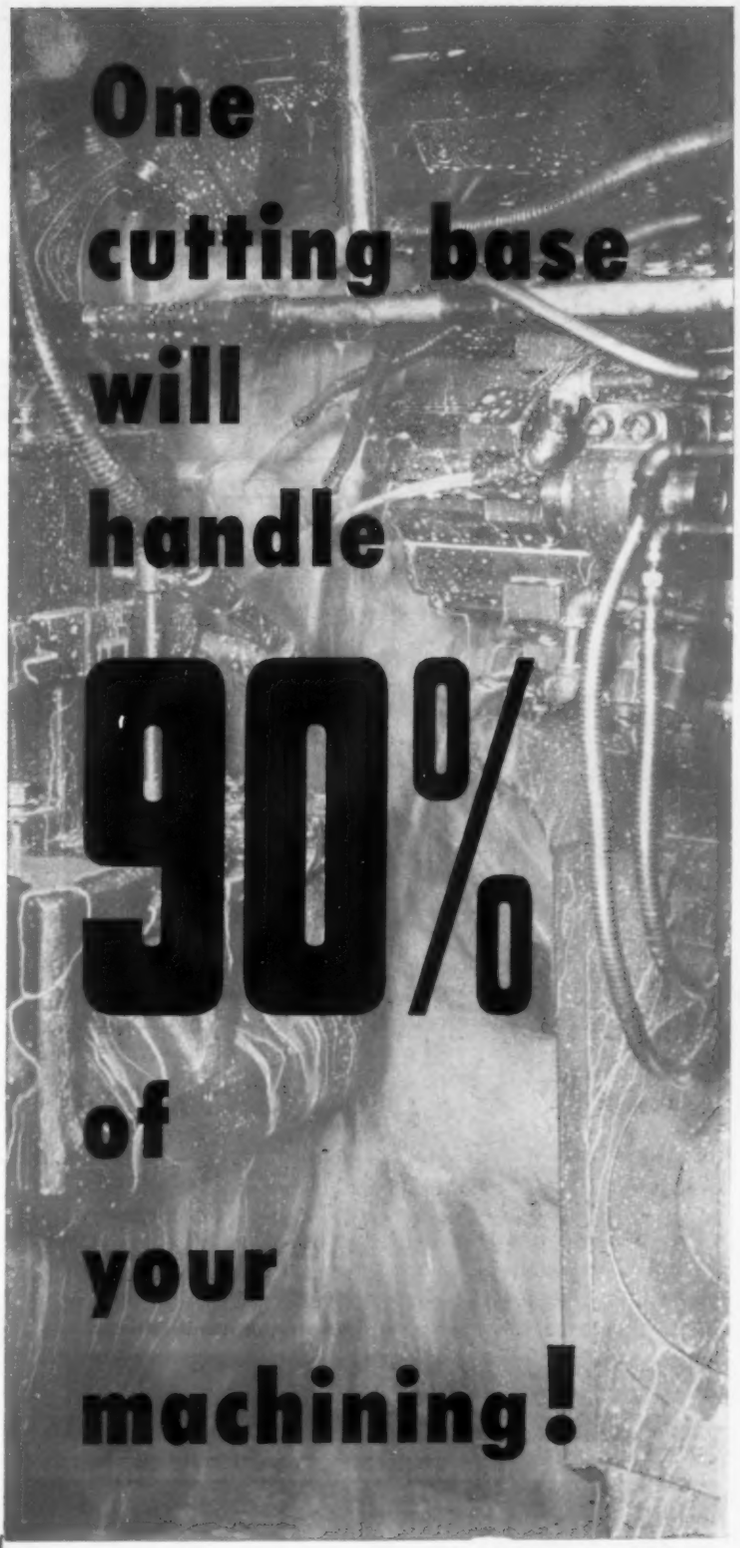
A few short months ago Houghton announced the "biggest news in cutting coolants since 1915."

It was Antisep All-Purpose Base—possessing all the qualities of all the good cutting fluids you've ever used—a hundred oils wrapped up in one!

It's easy for us to be enthusiastic about this cutting base, because we've watched it spread from one operation to another in a goodly proportion of the country's largest and fussiest machine shops. They try it on one or two machines, and before you can say "Antisep All-Purpose Base" they've put it in every type of machine tool.

Here is a base miscible with either oil or water . . . high in fatty oil content . . . possessing a higher film strength than most lubricants . . . antiseptically treated . . . safe for automatics . . . providing cool work, finely finished, with lengthened tool life.

One can hardly ask for more. When you want factual proof and price, please write E. F. HOUGHTON & CO., 303 W. Lehigh Ave., Philadelphia 33, Pa., or ask the Houghton Man who calls on you.



Houghton's
ANTISEP
All-purpose Base

Soluble in both oil and water. High in fat content and film strength. Excellent for drawing, too!

NO BLOWER or POWER NECESSARY

Pipe Burners

Nozzle Burners

Ring Burners

. . . Just Connect to Gas Supply

BUZZER Gas BURNERS

Reg. U.S. Pat. Off.

For Many Industrial Gas Uses

Designed to solve numerous Industrial Gas applications, "BUZZER" Burners are unexcelled for Efficiency, Economy, Simplicity and Flexibility. Large variety of models available.

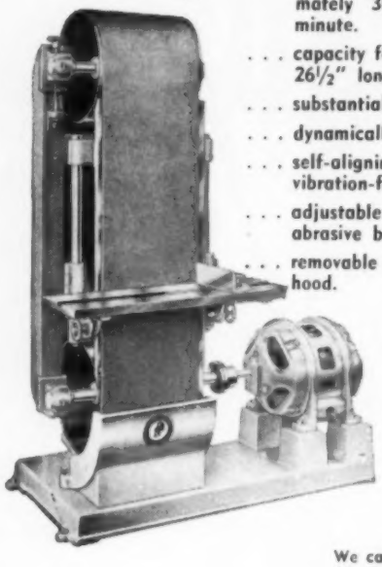
Send for the "BUZZER" Catalog showing complete line of Industrial Gas Burners, Furnaces and other equipment.

CHARLES A. HONES, INC.

121 South Grand Avenue, Baldwin, L. I., N. Y.

Faster, easier surface finishing is offered by the "PEERLESS" No. 4-14 Vertical Machine

featuring



. . . 14" belt running at approximately 3400 surface feet per minute.

. . . capacity for handling work up to 26½" long.

. . . substantial base and frames.

. . . dynamically balanced drums.

. . . self-aligning ball bearings for vibration-free operation.

. . . adjustable and easily changed abrasive belt.

. . . removable gage and hinged dust hood.

Height 67"; width 50"

Floor to belt table 27"

Table 15⅝" x 35"

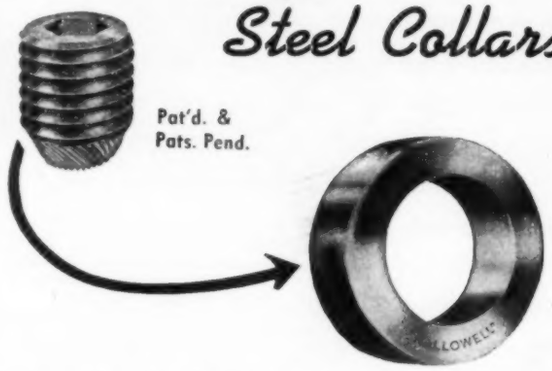
Drums 15" x 15"

We can furnish this machine in 9", 14" and 20" vertical or horizontal types.

Write for illustrated literature

Production MACHINE COMPANY GREENFIELD, MASSACHUSETTS, U.S.A.

HALLOWELL Steel Collars



Pat'd. & Pats. Pend.

"Hallowell" Solid Steel Collars, functionally proportioned throughout, are precision-machined so faces run perfectly true . . . are also highly polished all over . . . yet they cost less than common cast iron collars. 3" bore and smaller are made from Solid Bar Stock. To make sure the collar won't shift on the shaft, they are fitted with the famous "Unbrako" Knurled Point Self-Locking Socket Set Screw—the set screw that won't shake loose when once tightened. "Hallowell" . . . a "buy word" in shaft collars . . . available in a full range of sizes for

IMMEDIATE DELIVERY

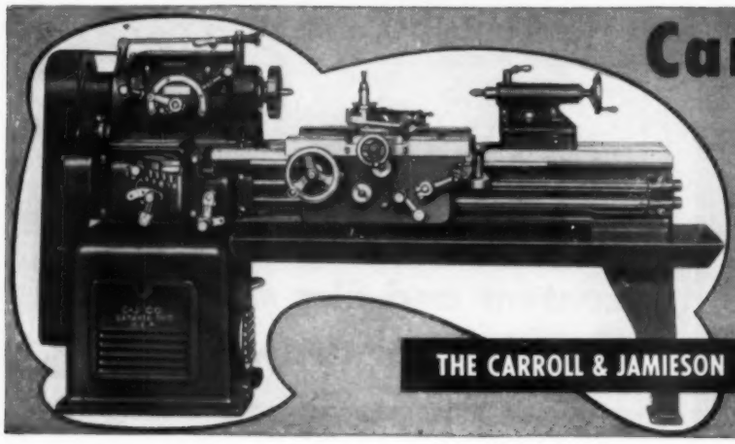
Write us for the name and address of your nearest "Hallowell" Industrial Distributor and for your copy of the "Hallowell" Catalog.

OVER 45 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNSYLVANIA BOX 4

CHICAGO - DETROIT - INDIANAPOLIS - ST. LOUIS - SAN FRANCISCO

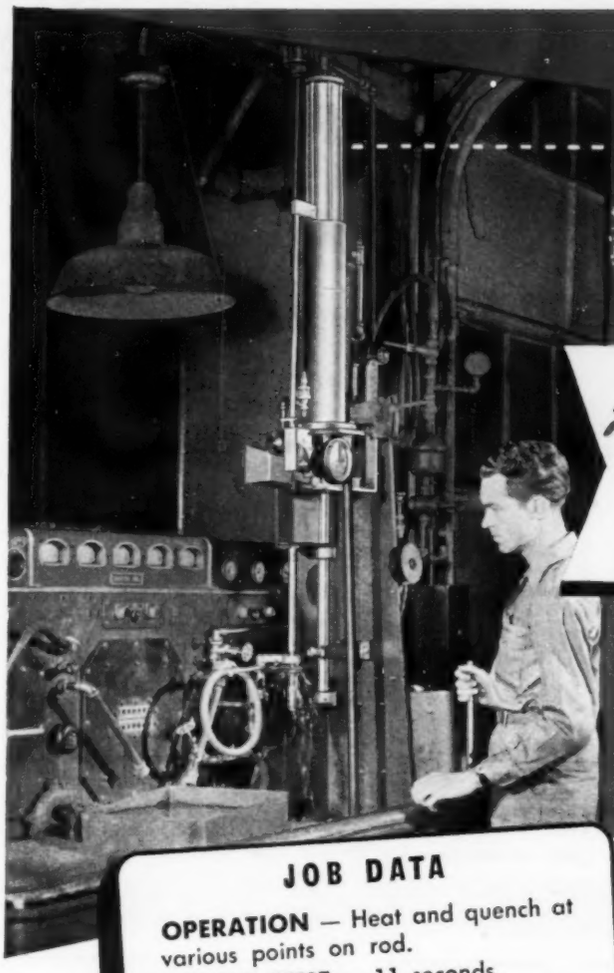


Carroll & Jamieson 16" LATHE

12 Speed Geared Head Motor Drive
Timken Mounted Spindle
Modern Design—
Liberal Dimensions

WRITE FOR BULLETIN

THE CARROLL & JAMIESON MACHINE TOOL CO., BATAVIA, OHIO, U. S. A.



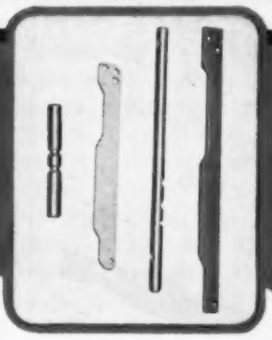
"LOGAN"

Air-Draulic Cylinder

AIR POWERED — OIL REGULATED

Accurately

FEEDS SHIFT ROD for INDUCTION HEAT TREATING



- AIR Actuation with HYDRAULIC-TYPE Control Permits Varying Feed
- Automatic Interlocking Control of Cylinder and Induction Heating Coil

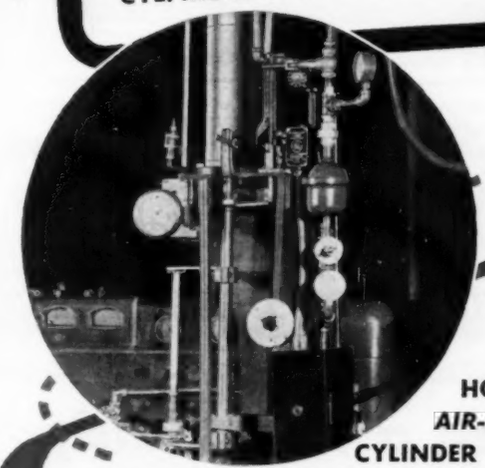
JOB DATA

OPERATION — Heat and quench at various points on rod.
STROKE TIME — 11 seconds.
CYL. SIZE — 3" bore, 15" stroke.
AIR PRESSURE—90# reduced to 70#.
CYL. MOUNTING — Rod-end flange.

Uniformly accurate feed at a varying rate is required to heat treat sections of automotive shift rods at the plant of a large independent transmission producer. While compressed air is available, ordinary air cylinders do not provide the necessary control and uniformity of movement. The answer was found in the Logan *Air-Draulic* Cylinder.

An electric solenoid operated valve controls the air which powers the cylinder, and the cycle is initiated by pressing a button on the machine panel. As the *air piston* moves, oil flows between the chambers of the *hydraulic piston* on the common piston rod. Piston speed is regulated by a cam-operated valve in this self-contained hydraulic circuit.

A cam attached to the piston rod is designed to provide rapid approach and accurate feed at the required speed, with rapid completion of the stroke and return. Induction heating and quenching are co-ordinated with the cylinder movement. Shift rods of several sizes are handled on this machine by substituting different cams.



HOW THE *AIR-DRAULIC* CYLINDER IS MADE

- Separate air and hydraulic pistons assembled as an integral unit on a common piston rod.
- Self-contained hydraulic circuit does not require a hydraulic power unit.
- Air *operating* cylinder is brass-lined steel tubing; piston has cup packings, self-adjusted by air.
- Hydraulic *regulating* cylinder is centrifugal-cast iron; piston has 3 automotive-type rings.
- Standard sizes from 3" to 8" bore; any stroke to 5 ft. For operation at air pressures to 150 p.s.i.

Write for FREE Literature and Engineering Help

Logan

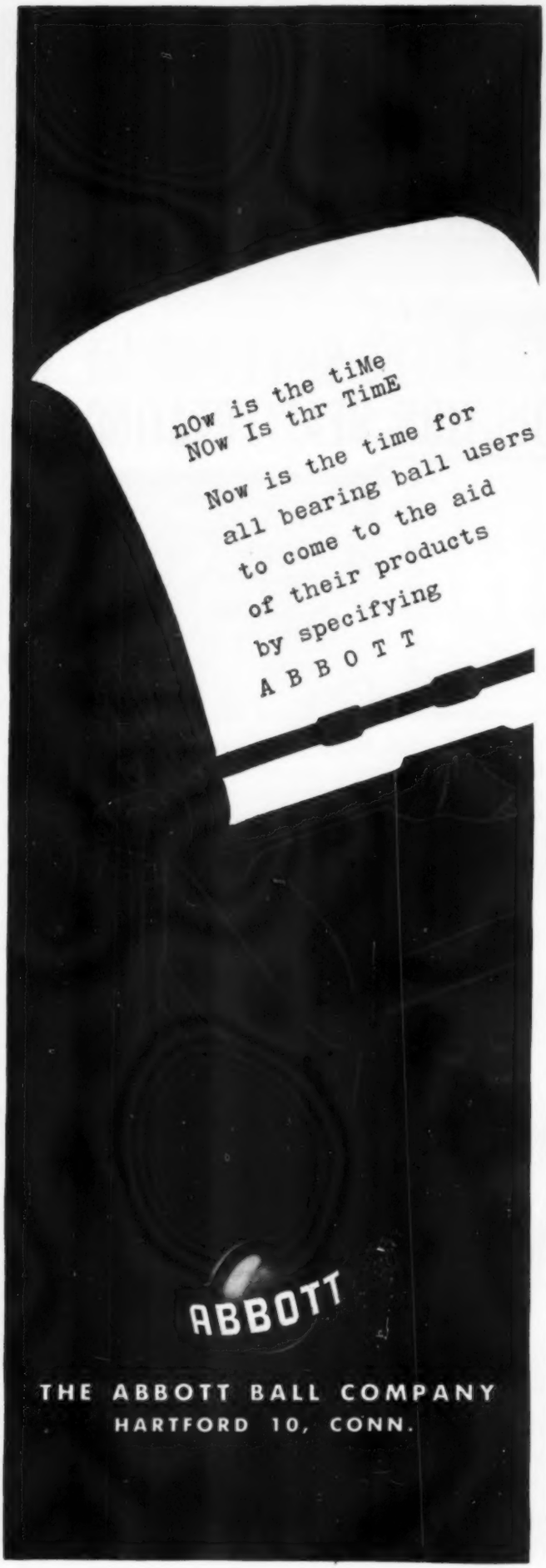
SAVES ★TIME ★EFFORT ★MOTION

Air and Hydraulic Equipment

LOGANSPORT MACHINE CO., INC.

918 CENTER AVE. LOGANSPORT INDIANA

CHUCKS • CYLINDERS • VALVES • PRESSES • SURE-FLOW COOLANT PUMPS



SAVE TIME SAVE MATERIAL

WITH "Standard" SWAGING MACHINES by FENN

SHAPE AND JOIN METALS WITHOUT CUTTING

For reducing, tapering, and forming bar stock or tubing and for assembling fittings to cable, wire, or tubing, "Standard" Swaging Machines give profitable, rapid-fire production. Surface is smooth and strength is increased through this cold forming method. *There's no waste of material.* Look into the many extra features of "Standard" Swagers for fast, efficient operation.

16 mm Sound Film, 26 minutes, showing principle and applications of Swaging, available to engineering and production groups. Write for open dates.

THE FENN MANUFACTURING CO.
1842 Broad Street P. O. Box 235 Hartford 1, Conn.

Manufacturers of "Standard" Power Presses to 500 Tons • Rolling Mills • Swagers • Turks Heads • Also Fenn Special Machinery

D. A. Stuart Oil CO.
EST. 1865 LIMITED
2729 SOUTH TROY STREET, CHICAGO 23, ILL.

STUART *service goes with every barrel*

Severance CARBIDE MIDGET MILLS

Operate at grinding-wheel speeds
Outlast scores of mounted points
Cut 50 times faster
MANY SHAPES and SIZES
Cut hard materials - Rockwell 65-C

Write for Catalog No. 16

May be REGROUND time-after-time by Severance—savings are thus multiplied

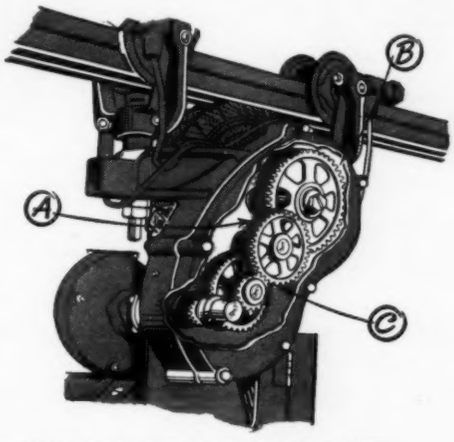
SEVERANCE TOOL INDUSTRIES, INC.
726 Iowa Ave., Saginaw, Michigan

Make a Time Study
OF
NICHOLSON EXPANDING MANDRELS

Time studies show that, with these widely used precision tools, operations can frequently be completed in less time than was formerly consumed in locating or turning a solid arbor. Set of 14 does work of 209 solid arbors. Two types. Sold singly or in sets; for bores ½" to 7". BULLETIN 1043.

W.H. NICHOLSON & CO., 114 Oregon St., Wilkes-Barre, Pa.

CASE 1062 -- MAINTAINING LUBE FILM ON HEAVY-DUTY GEARS.



HOIST GEAR UNIT FOR OVERHEAD CRANE

Viscous and tacky Calol Vistac Oils stuck tight under extreme pressures on hoist gears. Efficient for all heavy-duty gears, like industrial reduction sets. Come in six grades, 9X (SAE 10) to 45X (SAE 40). Apply by forced-feed or gravity lubricators, bottle- or wick-oilers.

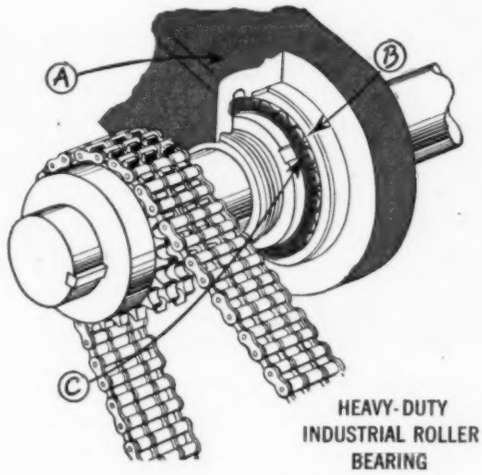
A. Contain oiliness and extreme-pressure compounds. Tough film won't rupture, even on slow-moving gears with extreme pressures on wide area for long time.

B. Economical - little required to provide adequate lubrication and dissipate heat. Resist highest operating temperatures.

C. High affinity for metal maintains lubricating film, reduces power loss and wear.

Calol Vistac Oils also recommended for lubrication of air hammers, rock drills and other air-powered tools ... atomize quickly and stay fluid at low temperatures.

CASE 1047A--KEEPING GREASE IN BEARINGS WHERE TEMPERATURES AND PRESSURES ARE EXTREME.



HEAVY-DUTY INDUSTRIAL ROLLER BEARING

When the temperature in a heavy-duty industrial anti-friction bearing reached more than 200° F., Calol E. P. Roller Grease provided adequate lubrication. Was originally developed for roll neck bearings in steel mills. Handles easily in pressure systems in all operating temperatures.

A. Resists extreme heat in housing caused by high ambient temperatures.

B. Contains extreme-pressure additives. Lubricating film will not squeeze off under the heaviest loads.

C. Highly water-resistant ... melts slowly and feeds evenly ... creeps into small clearances.

Calol E. P. Roller Grease will not corrode bearing metals and is specially made to meet heat and pressures too high for conventional anti-friction-bearing greases.

For additional information and the name of your nearest Distributor, write

STANDARD OIL COMPANY OF CALIFORNIA

225 Bush Street, San Francisco 20, California

The California Oil Company
Barber, New Jersey

The California Company
17th and Stout Streets, Denver 1, Colo.

Standard Oil Company of Texas
El Paso, Texas

RPM CALOL

Trademarks Reg. U. S. Pat. Office

More Alike Than Peas In A Pod!

Drills Sharpened on the OLIVER "510" Drill Pointer

OLIVER OF ADRIAN

Judged by today's standards of accurate work, peas seem as unlike as fingerprints. But with the Oliver "510", drills are sharpened so alike as to pass the most exacting inspection. Oliver gives you the *only* theoretically correct point—judged by competent authority to be *practically perfect*—assuring longer drill life, better work, lower cost.

There are other savings, too, in that drills sharpened on the "510" last longer between grinds—require less feeding pressure and horsepower to operate.

TRY THIS:

Write today for our "510" catalog. At the same time, send us a few drills to sharpen for you, without obligation. Test them on your own job — we feel sure you will sell yourself on the value of the "510" Drill Pointer.

OLIVER INSTRUMENT CO.
1414 E. Maumee St., Adrian, Michigan

IMPROVE YOUR TOOLROOM IT'S THE BACKBONE OF PRODUCTION

OLIVER OF ADRIAN

AUTOMATIC DRILL GRINDERS · TOOL & CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

Investigate

THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER on Your Work

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

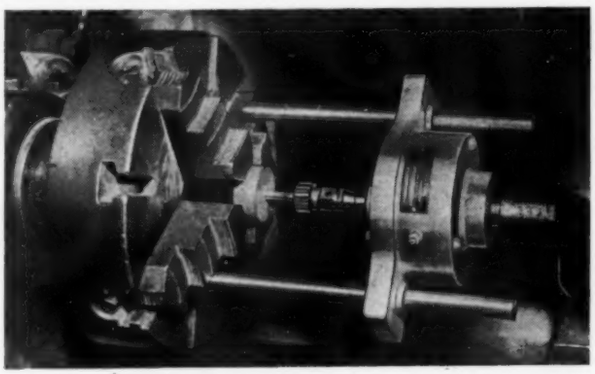
• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, and offset holes. We also manufacture oil-grooving millers.

WRITE today for Catalog No. 16

NATIONAL MACHINE TOOL CO.
CINCINNATI 22, OHIO

HERE'S HOW: TO TAP—and back out— WITHOUT STOPPING THE WORK OR REVERSING THE MACHINE



The Errington Auto-Reverse Turret Lathe Tapping Head is a new tool, practical, time-saving, money-saving. In a turret lathe setup, as illustrated, it allows you to tap the hole and back out the tap without stopping the work or reversing the machine. It's easy to operate: you simply feed the tap into, and out of, the drilled hole while the work is turning in the one direction. The new Tapping Head is a money-saver in this respect, too: with the aid of a friction chuck, you can tap blind holes without any possibility of tap breakage.

Send for Complete Information

The ERRINGTON AUTO-REVERSE TURRET LATHE TAPPING HEAD

can also be used on drill press work for production-tapping. For this the Errington Head has a 2 to 1 reverse, and uses guide-bars to hold and steady the case.

Established 1891
ERRINGTON Mechanical Laboratory, Inc.
Main Office and Plant: STATEN ISLAND 4, NEW YORK

Used by

BULOVA • DU PONT • EASTMAN KODAK
R. H. FREITAG • GENERAL TIRE & RUBBER
GIDDINGS & LEWIS • GISHOLT • I. B. M.
INGERSOLL-RAND • LAMINA DIES & TOOLS
LANDIS TOOL • MALL TOOL • W. H. NICHOLS
PORTAGE MACHINE • and many others

for High Precision

SIP

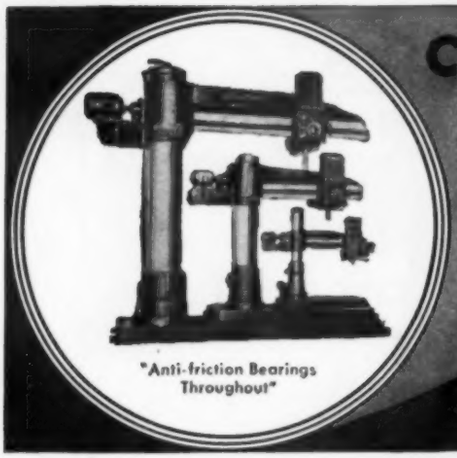
HYDROPTIC—B

The accuracy of many of the nation's most widely used products depends on the precision results obtained on SIP Hydroptic-B Jig Boring and Milling Machines. The built-in optical measuring system of the Hydroptic-B guarantees accuracy for all settings of 0.0002", making it a reliable basis of accuracy for all shop machining and measuring. Write for mechanical specifications and performance data.

COSA

COSA CORPORATION

624 CHRYSLER BUILDING, NEW YORK 17, N. Y.



CARLTON RADIAL DRILL

FEATURES: 1. Low Hung Drive to Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all Speeds. 4. Concentrated and Convenient Push-button Controls. 5. Constructed on Unit Principle.

THE CARLTON MACHINE TOOL COMPANY

CINCINNATI 25, OHIO, U. S. A.

For Faster Smoother Cleaner Grinding

ECONOMY

Grinding and Cutting Oils and Lubricants for Every Metal Working Purpose

THE WHITE & BAGLEY COMPANY
WORCESTER 8, MASS., U.S.A.

HARDNESS TESTER

The Scleroscope is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE
Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

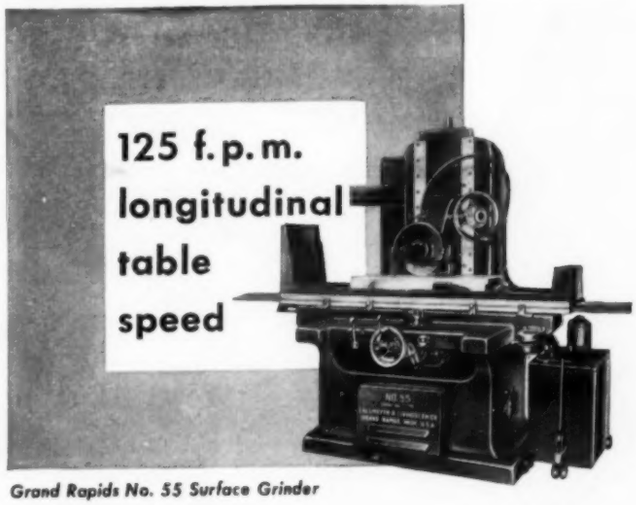
LINLEY

MILLER AND JIG BORER

Handles a wide variety of toolroom jobs with speed, accuracy, efficiency . . . die work, jig and model making, drilling, reaming, milling. Releases larger machines for work better suited to their capacities. Easy set-up, quick changeover . . . velvet-smooth feed, eight spindle speeds from 275 to 4250 rpm. . . simple, direct micrometer setting.

FOR COMPLETE INFORMATION, WRITE FOR BULLETIN.

LINLEY BROTHERS CO., 664 STATE ST. EXTENSION BRIDGEPORT 1, CONNECTICUT



Grand Rapids No. 55 Surface Grinder

Faster precision production is possible with the exceptional table speed of Grand Rapids Hydraulic Feed Surface Grinders. Both longitudinal table travel and cross feed are automatic, hydraulic. Wheel head is powered for rapid vertical travel.

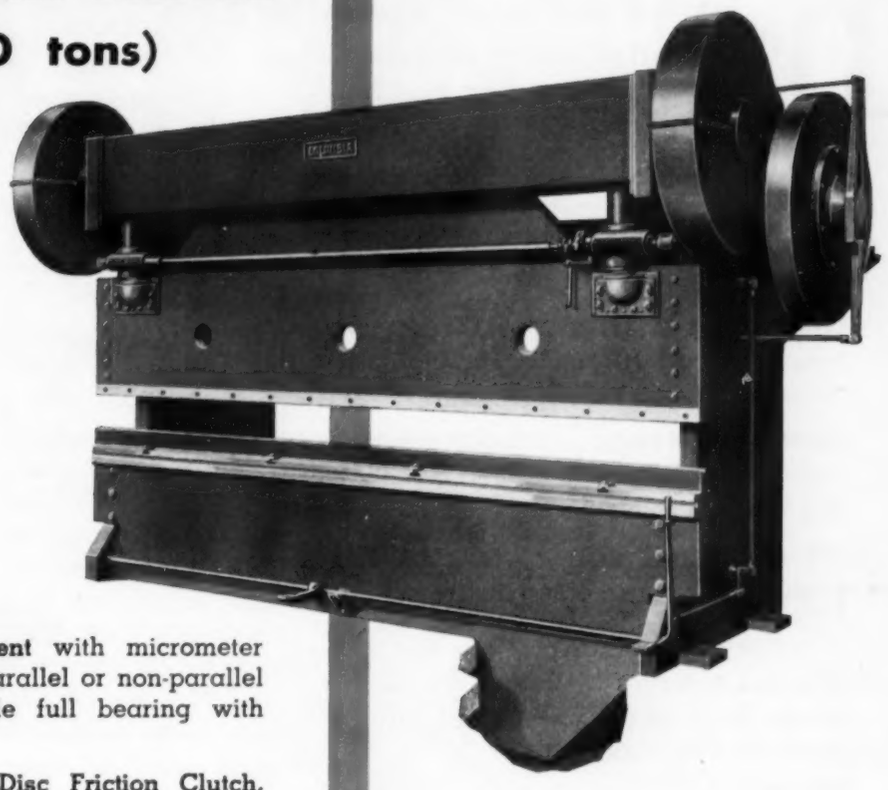
Write for Bulletin GL-101

GALLMEYER & LIVINGSTON COMPANY
Manufacturers of Grand Rapids Grinders
330 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.

now available

in capacities from 6 ft. to 20 ft. 1/8 in. to 1 in. thick

(120 to 500 tons)



To meet the growing demand, production facilities have been expanded to permit early shipment of Columbia Power Press Brakes in a complete range of sizes with capacities for forming mild steel from 1/8 inch to 1 inch thick in lengths from 6 feet to 20 feet. Each model incorporates all these production-proved, efficiency-increasing design features:

- **Motor Driven Slide Adjustment** with micrometer control. Slide easily operated parallel or non-parallel with base. Slide ways provide full bearing with housing guides.
- **Manually-Operated Multiple Disc Friction Clutch,** positive, dependable.
- **High-Efficiency Drum-Type Friction Brake** positively holds at any part of stroke.
- **Wedge-Type Release Mechanism** relieves ram in case dies are bottomed to the extent that brake stalls.
- **Rolled Steel Plate Construction** for strength rigidity Maximum deflection is .001" per foot of machine width.
- **Twin-Drive Cut Steel Main Gears,** on all sizes except the 120-ton size. Back gears operate in oil within oil-tight case.
- **One-Piece Forged Eccentric** of heat-treated high-carbon steel.
- **Centralized Lubrication** to all main bearings.
- **Safety Enclosed Drive.** Motor pulley, flywheel, V-belt fully enclosed.

Write for Bulletin and name of nearest Columbia Representative.

Columbia

POWER PRESS BRAKES

COLUMBIA MACHINERY AND ENGINEERING CORPORATION

ONE OF AMERICA'S LEADING MANUFACTURERS OF STEEL SQUARING SHEARS AND POWER PRESS BRAKES

HAMILTON, OHIO

gives

YOUR ZINC DIE CAST PRODUCTS
lasting corrosion protection
...better paint adherence...
colorful, *salable* finishes

By a simple quick dip, manually or in automatic machines, Iridite provides a triple-purpose finish on zinc die cast products—Iridite gives you—

CORROSION RESISTANCE...for protection from air, water, gasoline, other harmful corrosives.

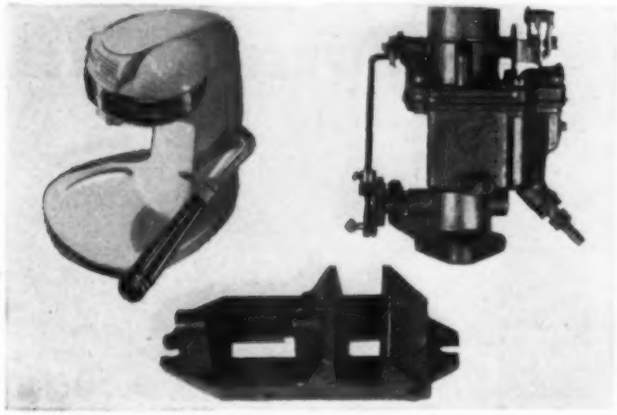
PAINT ADHERENCE...to vastly increase corrosion resistance and to secure a paint system that defies chipping, flaking, peeling

EYE APPEALING COLOR...that protects the product on the shelf, draws the customer's eye.

Iridite is a non-electrolytic chemical process, used and approved by leading manufacturers. If your products use zinc die cast parts, write today for information on how Iridite can help you make a better, more salable product.

JUICER — Fruit juicer, finished with Iridite to insure permanent adherence of sparkling enamel finish.

CARBURETOR — Automobile carburetor, finished with Iridite for protection against corrosion from gasoline, fuel line moisture.



VISE—Bench vise, finished with Iridite to provide permanent blacking and corrosion protection.

Allied Research Products, Inc.
101 CHEMICAL BLDG.
4004 E. MONUMENT STREET • BALTIMORE 5, MARYLAND

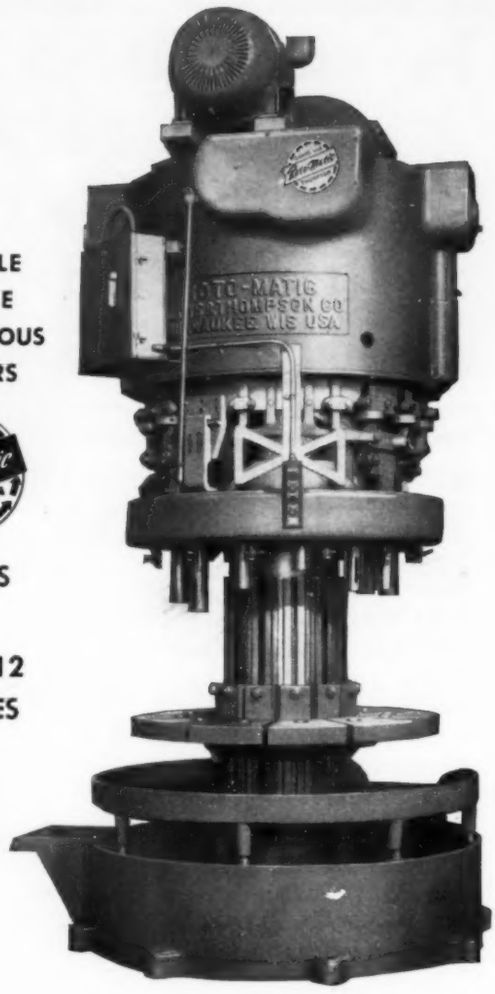
ROTO-MATICS

VERTICAL
MULTIPLE
SPINDLE
CONTINUOUS
DRILLERS

DAVIS and Roto-Matic THOMPSON

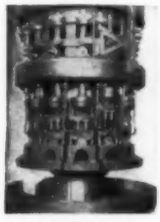
3 SIZES

6-8 OR 12
SPINDLES

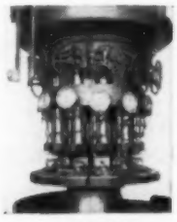


One Vertical ROTO-MATIC will equal the production of a whole battery of single spindle drillers with a proportionate reduction in labor and maintenance costs.

Where production demands fall below the capacity of the machine, on a single part, interchangeable fixtures can be designed for a variety of jobs. Where two operations are required on a single piece, requiring the same feeds and speeds, spindles can be arranged to give you the proper ratio of production.



2 SPINDLE
DRILL HEADS



BALANCING
OPERATION

AUTOMATIC
CLAMPING

Engineering skill and thirty years of development have given us the necessary background to tool up these machines for the maximum in efficiency and accuracy of work, whether it be drilling, milling, boring, reaming, spot facing or chamfering.

WRITE FOR BULLETIN 101.

DAVIS and THOMPSON CO.
MANUFACTURERS OF *Machine Tools*
MILWAUKEE 14, WISCONSIN

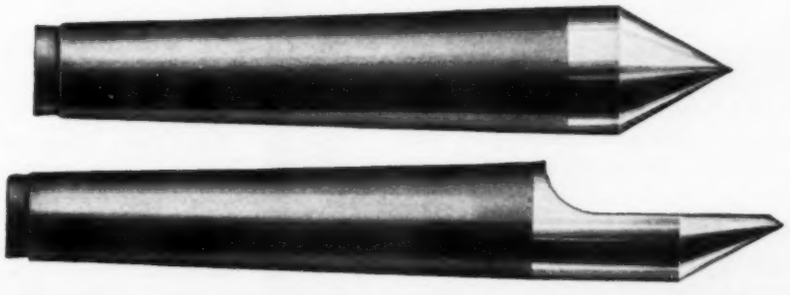
M-40-U *wear-resistant*

LASTS 3 TO 10 TIMES LONGER ON TOUGH JOBS

STEP UP and meet "M-40-U"—the wear-resistant alloy that is setting new standards for long life and performance. Developed by the Gorham Tool Company expressly for use as a wear and abrasion resistant metal, "M-40-U" alloy lasts *3 to 10 times* longer than high speed steel and other alloy materials for centers. Actual tests prove it far superior on the most rugged jobs. No waiting for delivery: Standard "M-40-U" alloy tipped centers can be furnished immediately from stock. ★ ★ ★ If you need *special* centers, our engineering department will help design them to your specifications. Choose GORHAM "M-40-U" for top performance and long wear.

GORHAM TOOL COMPANY

14400 WOODROW WILSON, DETROIT 3, MICH.



GORHAM

M-40-U ALLOY CENTERS

TROUBLE-FREE tapping is more than just a *wish* with Ettco-Emrick Attachments. These high-speed, hair-trigger sensitive tappers *give* you fast, accurate tapping—with full protection against tap breakage and work spoilage—at very modest tool cost. They come in a complete range of sizes for No. 0 to 1" taps.

BULLETIN No. 22 gives full details. Write for a copy today.

ETTCO TOOL CO.

590 Johnson Ave., Brooklyn 6, N. Y.

Boston, Mass. • Portland, Conn. • Detroit, Mich. • Chicago, Ill.

Over 25 years specialization in solving Industry's drilling and tapping problems

---

WHATEVER YOUR HOLDING PROBLEM—
APPLY *Erickson Accuracy*
INCREASE PRODUCTION!
CUT COSTS!

COLLETS - COLLET CHUCKS - MANDRELS
ALSO ERICKSON-STATE BORING BAR

Holding difficulties melt away before Erickson Precision Holding Tools. Up goes production; down go costs. Many "Specials" lick unusual requirements. The Erickson technical staff will be glad to tackle that particularly knotty job which may be clogging your profit column.

Write for Catalog "A-12"

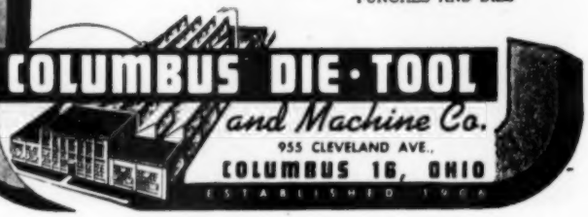
ERICKSON TOOLS DIVISION
2302 Hamilton Ave. • Cleveland 14, Ohio

ERICKSON = *Collet Chuck Precision*

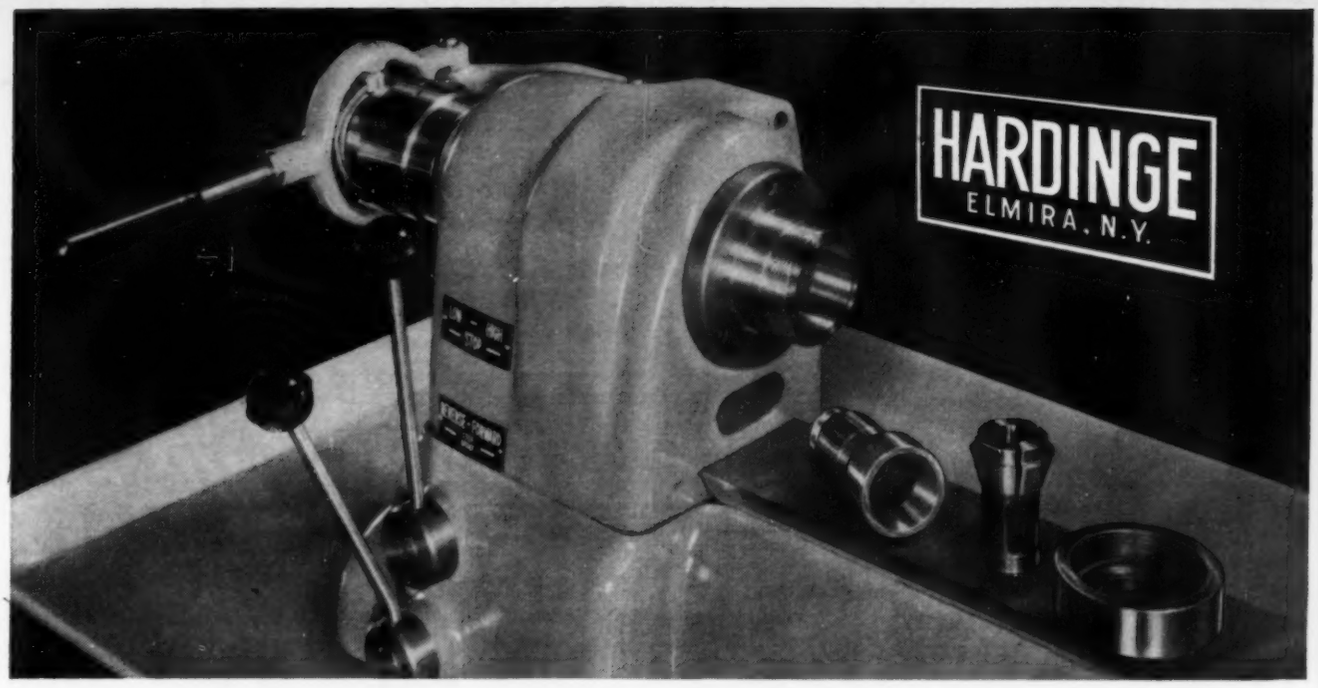
SPECIFY
"COLUMBUS DIE-TOOL"
FOR YOUR
SPECIAL TOOLS

For over 40 years Columbus Die Tool have maintained a nation-wide reputation for designing and building special-purpose machinery and tools for particular jobs. We design and manufacture the right tool for your special job quickly, accurately, and economically. Specify Columbus, and be satisfied!

JIGS • FIXTURES • SPECIAL TOOLS
BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
PUNCHES AND DIES



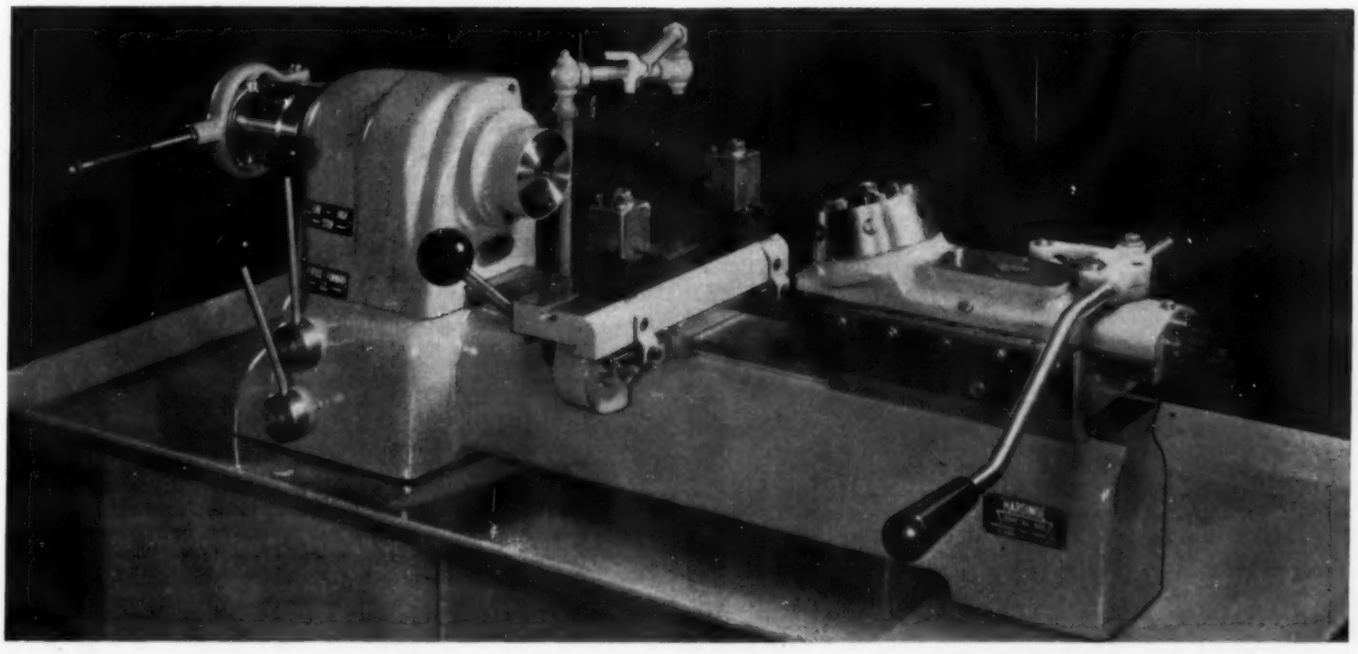
COLUMBUS DIE-TOOL
and Machine Co.
955 CLEVELAND AVE.
COLUMBUS 16, OHIO
ESTABLISHED 1906



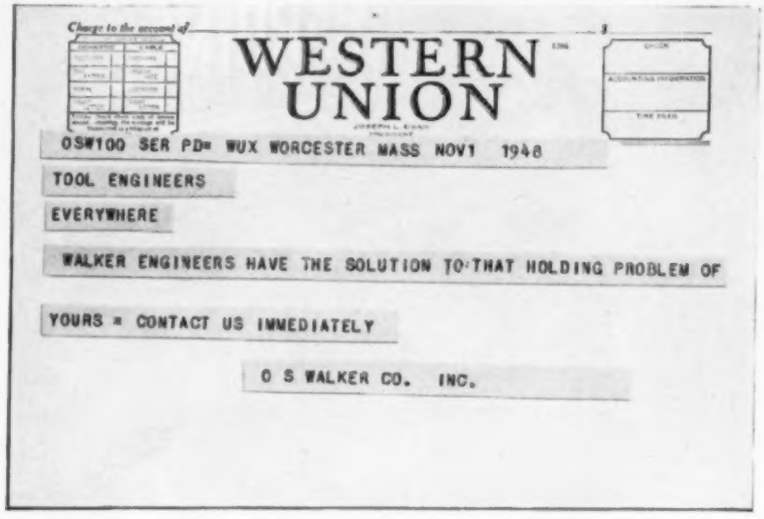
HARDINGE
High Speed Precision Second Operation Machine *with* STATIONARY COLLET

Close observation in Production Departments reveals the need for a specific type of machine for a certain class of work. This is particularly true when close tolerances exist for length or shoulder-specifications. In such instances, push-out or draw-in collets are not as satisfactory as a stationary collet arrangement.

This machine combines all the features of the model DSM59 Hardinge Second Operation Machine with the addition of the stationary collet feature (No. 21 Brown & Sharpe Style Collet) for length holding second operations. Ask for bulletin VBS.



Offices in principal cities. Export office, 269 Lafayette St., New York 12, N. Y.


Charge to the account of

WESTERN UNION

OSW100 SER PD= WUX WORCESTER MASS NOV1 1948

TOOL ENGINEERS

EVERYWHERE

WALKER ENGINEERS HAVE THE SOLUTION TO THAT HOLDING PROBLEM OF

YOURS = CONTACT US IMMEDIATELY

O S WALKER CO. INC.

Yes, when an unusual holding problem will not permit the use of a standard chuck, Walker Engineers design the right magnetic holding device, to meet the requirements of the particular problem.

Through research and engineering during the past sixty years Walker has designed and made special chucks to hold all types of irregular contours and shapes—shape or size is no restriction, for if the piece to be processed can be held, Walker will find a way to hold it.

Manufacturers throughout the world have found this engineering service has enabled them to save hours in production. It costs nothing to have our engineers study your problem . . . their suggestions will pay you dividends!

Hold Everything! with Walker Chucks

Walker Chucks

O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

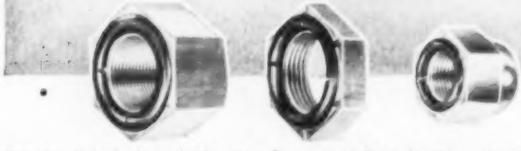
Original Designers and Builders of Magnetic Chucks

Walker Chucks

THERE'S A RIGHT LOCK NUT FOR YOUR JOB!

Chances are four out of five it's An-cor-lox. Check these advantages!

- Can't shake loose
- Not affected by sawed-off or drilled bolts
- Can be re-used many times
- Locking ring on bottom, uses short stud
- Uses standard wrenches
- Won't damage bolt or work
- Competitively priced
- Spins on stud by hand
- Locking ring forms a pressure seal
- Not affected by temperature
- Choice of finishes for corrosive or severe atmospheric conditions



Get the right lock nut! We strongly urge a careful testing and will be glad to have our engineers check special applications. Send today for our descriptive folder or free standard samples to fit your particular needs.

An-cor-lox TRADE MARK REGISTERED *Lock Nuts*

LAMINATED SHIM CO., Inc., *An-cor-lox Division*, 3112 Union St., Glenbrook, Conn.

AN-COR-LOX NUTS • SHIMS • SHIM STOCK • STAMPINGS

SIMPLICITY ITSELF . . .

UNITED STATES No. 1 FULL ANTI-FRICTION BEARING HAND MILLING MACHINE

Fewer parts; easy and economical to operate.

Ask your distributor for full details or write direct.

UNITED STATES MACHINE TOOL CO.

16 E. 72nd St., Cincinnati 16, Ohio

FOR

GUARANTEED PITTSBURGH

ARMORED GEARS

OUTLAST UNTREATED GEARS

FIVE TO ONE

Yes . . . for really tough jobs, as well as ordinary ones, there is no matching the Pittsburgh ARMORED GEAR Line for long life. Not only will ARMORED GEARS outlast untreated gears 5 to 1, but they also last 1 to 1½ times longer than oil treated gears . . . and equal or exceed the life of any other heat treated ones. That's what we guarantee!

DISTRIBUTORS' INQUIRIES INVITED

ARMORED GEARS

PITTSBURGH GEAR COMPANY | 27th & Smallman Streets PITTSBURGH 22, PA.

QUALITY GEARS FOR OVER 30 YEARS

PITTSBURGH AD—4

Every Earle Gear—large or small—is expertly made to meet your most exacting requirements.

They can be cut from any practical material—are supplied in sizes ranging from inches up to 30 feet in diameter.

Each gear is accurately cut to close tolerances to assure smooth, quiet operation and better power transmission—is ruggedly built for long life.

So—if you need gears, and need them now—send us drawings and specifications for quotation. You'll get immediate attention and prompt delivery.

The EARLE GEAR & MACHINE COMPANY, *Main Offices:* 4723 Stenton Ave., Phila. 44, Pa., *Sales Offices:* 149 Broadway, N. Y. 6, N. Y.; 901 Davis Avenue, Pittsburgh 12, Pa.

EARLE GEARS

SPUR • BEVEL • WORM • SPIRAL • CONTINUOUS TOOTH HERRINGBONE • SPROCKETS • RACKS • ETC.

No. 1 in a series of performance case histories

Grant REDUCER in use 20 years

. . . NOT A PENNY SPENT ON MAINTENANCE

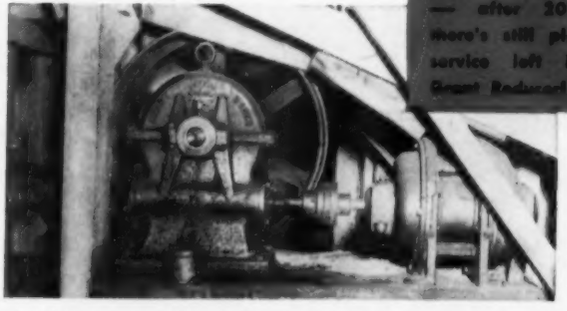
. . . H & P Spool and Bobbin Co., Lawrence, Mass., gives the details of another great performance story:

H & P SPOOL & BOBBIN COMPANY

LAWRENCE, MASSACHUSETTS

Early in 1928 we installed a Grant 5⅝" Model B Worm Gear Reduction Unit as the driving medium on a horizontal conveyor. This Unit gave a reduction in speed of 33 - 1, power being supplied by a 2 H.P., 1200 R.P.M. Motor directly connected to the reduction unit by a flexible coupling. This Unit has operated approximately thirty hours per week since installation, without attention or repair except for regular cleaning and lubrication. A good record for a good unit.

Here's the investment — after 20 years there's still plenty of service left in this Grant Reducer!



Performance stories like the one above don't "just happen". Grant Reducers perform years longer without maintenance because they are designed and built from the finest materials with utmost precision. All Grant Reducers are equipped with radial thrust ball bearings, oil seals, gears of high test bronze, worms of chrome vanadium steel and many others.

Decide now to cut maintenance costs in your plant — install Grant Reducers for long trouble-free service.

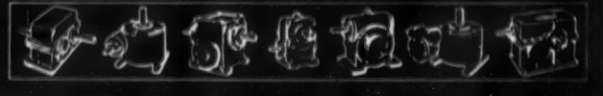
Grant Gear Works, Inc., 169 West Second Street So. Boston 27, Mass.

WRITE TODAY FOR FREE CATALOGUE

1877 - GEARED TO INDUSTRY'S NEEDS FOR 71 YEARS - 1948

Grant SPEED REDUCERS

7 gear arrangements — hundreds of ratios



GANSCHOW CUT GEARS

SPUR—SPIRAL
BEVEL—RACK
AND PINION

UP TO 60" PITCH DIA.
UP TO 10" FACE WIDTH

GANSCHOW GEAR CO. • 14 N. MORGAN ST., CHICAGO 7.

GEAR CUTTING MACHINES

Well Designed
Good Features
Create Production Advantages

43 Years' Experience

NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK 5, NEW JERSEY
FRANK E. EBERHARDT, *President*

QUALITY GEARS CUT TO ORDER

• MEISEL produces but one *kind* of gears . . . gears constructed for specific jobs. Only through the inherent accuracy of this special designing could such dependability, performance and economy be possible. Tell us what you expect it to do, and we'll show you the one gear suited for your job.

MEISEL PRESS MFG. CO.
94th Dorchester Avenue Boston Mass

GEARS
CAMS
THREAD GRINDING

Any size or shape to utmost accuracy. For quotation on price and delivery Write Dept. G 2

HARTFORD *Special*

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD 5, CONN.

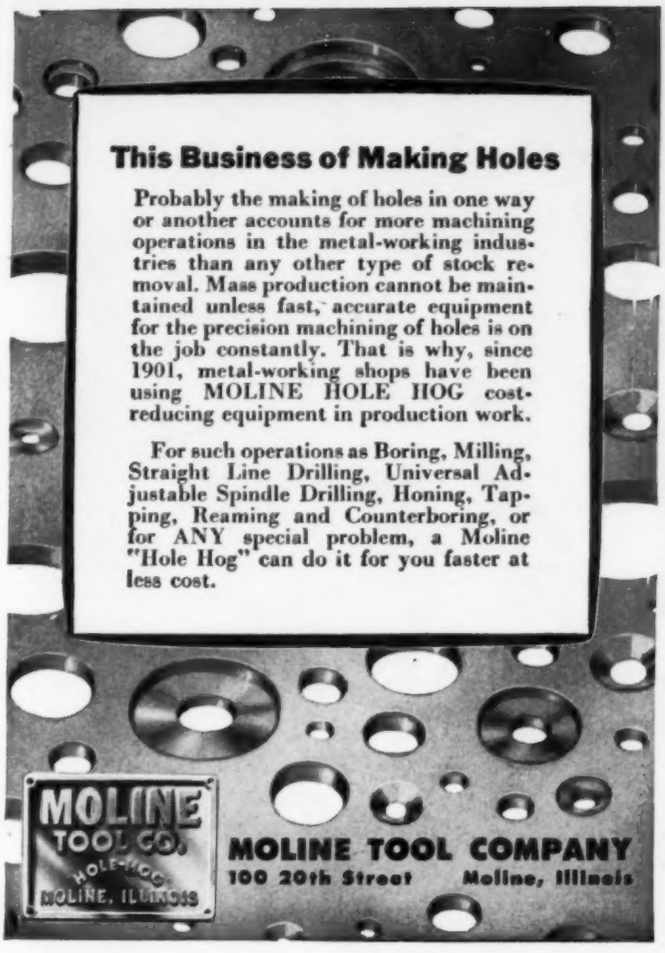
Smoother . . . Quieter OPERATION
. . . WIDER OPERATING TOLERANCE

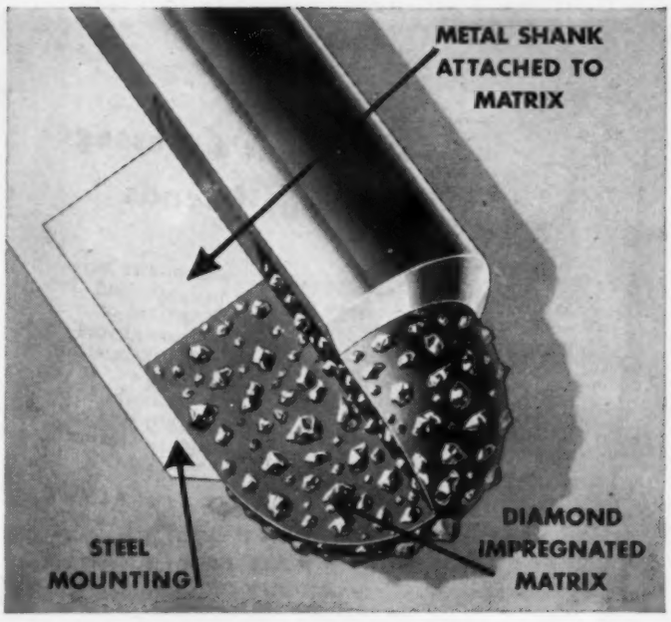
An outstanding characteristic of Cincinnati Coniflex* Gears is the localized tooth contact. This permits a wider operating tolerance . . . allowing slight deflections in operation without dangerous concentration of the load at the ends of the teeth.

For smoother . . . quieter operation, with easier and faster assemblies . . . we suggest Cincinnati Coniflex* Gears.

* Registered in the U. S. Patent Office.

THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
Wooster Pike and Mariemont Ave. ★ Cincinnati 27, Ohio


This Business of Making Holes
Probably the making of holes in one way or another accounts for more machining operations in the metal-working industries than any other type of stock removal. Mass production cannot be maintained unless fast, accurate equipment for the precision machining of holes is on the job constantly. That is why, since 1901, metal-working shops have been using MOLINE HOLE HOG cost-reducing equipment in production work.
For such operations as Boring, Milling, Straight Line Drilling, Universal Adjustable Spindle Drilling, Honing, Tapping, Reaming and Counterboring, or for ANY special problem, a Moline "Hole Hog" can do it for you faster at less cost.
MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS
MOLINE TOOL COMPANY
100 20th Street Moline, Illinois



YOU CAN'T LOSE!

No, you can't lose diamonds from *this* dresser. They're imbedded in a matrix of Carboloy Cemented Carbide —*they stand abuse and can't come loose!*

This dresser permits the use of *smaller* diamonds, that cost 40% less than the usual larger diamonds—yet give you a greater number of keen cutting edges!

You'll find this diamond dresser one of the biggest factors in your grinding department for keeping costs down.

Carboloy diamond dressers last longer, need no remounting, true wheels faster—and *cost as little as $11.90!*

Send the coupon asking for free booklet. There's no obligation . . . and you stand a chance to save up to 40% on dressing costs!

CARBOLOY COMPANY, INC.

11149 E. 8 Mile Street • Detroit 32, Michigan

FREE BOOKLET

DIAMOND DRESSERS

by CARBOLOY ®

CARBOLOY COMPANY, INC.
11149 E. 8 Mile Street, Detroit 32, Michigan

Gentlemen:

Please send me free booklet No. DR-480, describing how these Carboloy dressers can save up to 40% on my dressing costs.

NAME_____

TITLE_____ COMPANY_____

STREET_____

CITY_____ ZONE_____ STATE_____

BUY U.S. SECURITY BONDS NOW!

GEARS MADE

FROM YOUR PRINTS

Prompt delivery on any type gear —any size from the smallest up to 60" dia.

- Spur Gears
- Bevel Gears
- Mitre Gears
- Helical Gears
- Internal Gears
- Worm Gears
- Herringbone Gears

Highest quality. Precision cut on new Sykes Generators and up-to-date machines. Over 40 years of gear manufacturing experience.

Send your gear prints to us today for prompt quotation!

AUTO ENGINE WORKS

341A N. Hamline Avenue St. Paul 4, Minn.

A New Year's message
to our friends
As a difficult year draws to a close we take this opportunity to express appreciation to our many customers for their business and for their patient understanding.
The unusual demand for steel created an almost insurmountable problem for the industry.
We tried to meet this situation to the best of our ability. New warehouses increased our facilities in 1948 and further improvements are planned for 1949. We are now at your service from coast to coast, determined to serve you better.
Meanwhile, let us extend our sincere best wishes for a happy holiday season and a successful New Year.
UNITED STATES STEEL SUPPLY COMPANY
BALTIMORE · BOSTON · CHICAGO · CLEVELAND · LOS ANGELES · MILWAUKEE
NEWARK · PITTSBURGH · ST. LOUIS · SAN FRANCISCO · TWIN CITY (St. Paul)
USS STEELS SERVICE

GRAY-MILLS

PORTABLE
PUMP UNITS

Use these compact self-contained units as

. . . Coolant Systems for all types of Machine Tools

. . . Stand-by Pump Units in case your built-in pumps fail

See your Industrial Distributor or send for catalog to

GRAYMILLS CORPORATION
1953 Ridge Ave. Evanston, Ill.

LAYOUT FLUID

Send for Your FREE Sample

For Machinists, Toolmakers, Diemakers, Model Makers, Template Makers and Layout Men—also for general machine shop and toolroom use on tools, dies, jigs and fixtures and machine surfaces, this Layout Fluid has a considerable advantage over the old copper sulphate method.

With the use of this Layout Fluid, you simply wipe the surface clean and brush it on. It dries instantly.

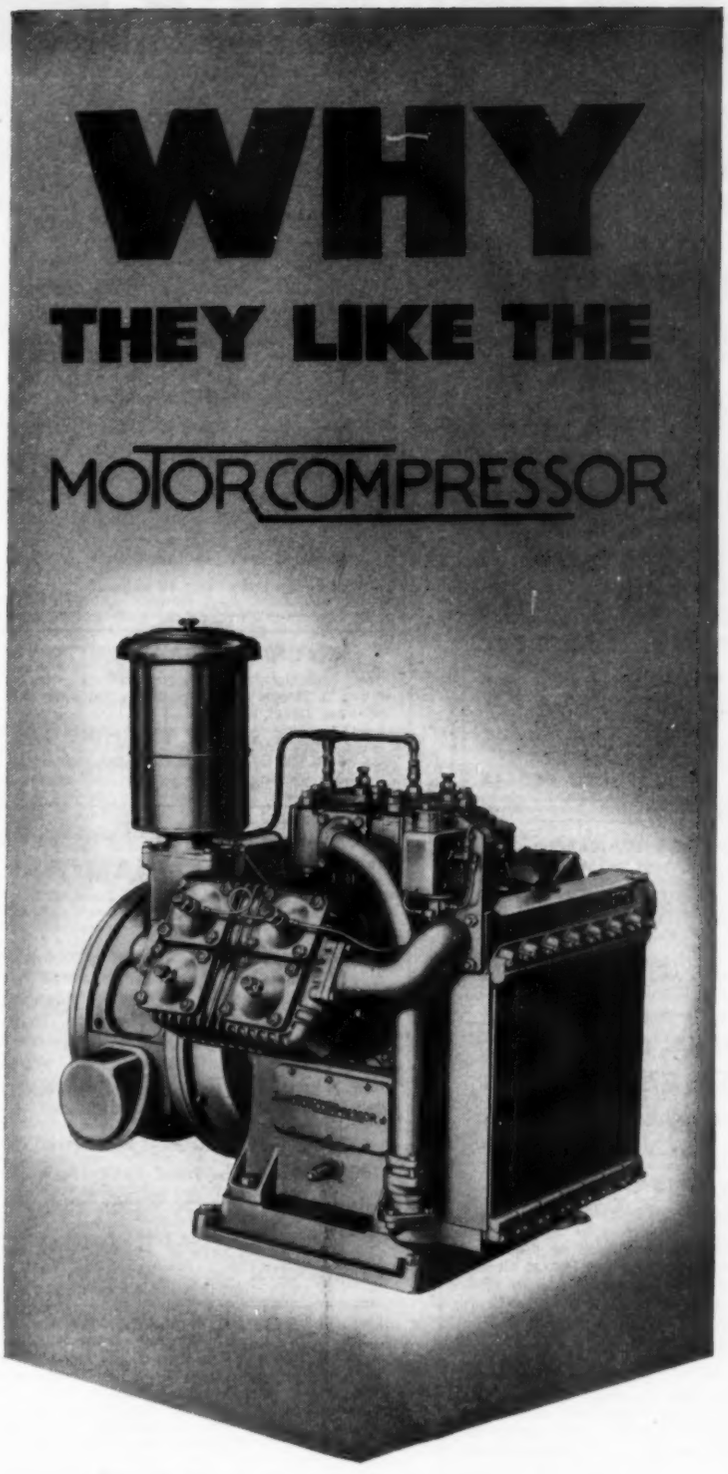
SEND FOR YOUR FREE SAMPLE of this Combination Brush-in-can. Please use your letterhead.

DAYTON ROGERS MFG. CO.
Minneapolis 7, Minnesota

YES, Mr. Employer
Disabled
DAV
Are Valuable

DISABLED AMERICAN VETERANS
IT'S GOOD BUSINESS TO EMPLOY DISABLED VETERANS
NATIONAL HEADQUARTERS—*Cincinnati, Ohio*

WHY THEY LIKE THE MOTORCOMPRESSOR



WHAT IS A MOTORCOMPRESSOR?

An Ingersoll-Rand two-stage, air-cooled compressor with a built-in motor . . . made in five sizes from 25 to 75-hp

WHAT IS IT FOR?

Compressing air to pressures up to 125 psi. It is ideal for main air supply . . . or for supplementing the capacity of larger compressors during peak loads . . . or for locations remote from main compressed-air lines . . . or wherever the advantages of air-cooling are important.

WHO LIKES IT?

Maintenance men, engineers, owners, and workers who rely upon a steady supply of Air Power . . . in mills, factories, mines, railroad yards, foundries, construction jobs, and aboard ship.

WHY THEY LIKE IT?

- Air-cooling eliminates the cost of water, water piping, and the danger of freezing.
- Two-stage compression saves power.
- Channel Valves are durable, efficient, stay tight.
- No need for special foundation.
- Compact and lightweight . . . easy to install or relocate.
- Timken tapered-roller main bearings.
- Constant-level lubrication is simple and trouble-free.
- Dual Control provides efficient regulation under any kind of load . . . a selector switch permits use of either constant-speed or automatic-start-and-stop control.
- Dependable in operation . . . easy to service and maintain.
- Built by Ingersoll-Rand . . . by the men who know Air Power, and who build both the compressors that generate it and the tools that use it.

AIR POWER . . . The Key to Lower Production Costs

1-980

Ingersoll-Rand

11 Broadway, New York 4, N. Y.

COMPRESSORS • AIR TOOLS • CONDENSERS • CENTRIFUGAL PUMPS • ROCK DRILLS • OIL ENGINES

CONTRACT WORK

KAMIS Engineering Company

Designers & Manufacturers of Tools & Machinery

Special machine work; facilities available for production quantities of small, medium and large machined parts, assemblies and fabrications. Specializing in stainless steel aviation gas turbine parts.

Send for Brochure No. 3 which describes our facilities in detail.

300 MOORE STREET
PHILADELPHIA 48, PA.

The Lowest Possible Die Cost For...

STAMPINGS

IN SMALL LOTS

DAYTON ROGERS MFG. CO.
Minneapolis 7, Minnesota

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

PREMIER MILL CORP.
GENEVA, N. Y.

Facilities available for production manufacturing of small precision parts; building and assembling special machines, small tools, jigs, fixtures, etc. Experience in special alloys such as Stainless Steel, Hastelloy, Ni-Resist, etc. *Inquiries Welcomed.*

Equipment List Sent on Request

F. F. SLOCOMB CORPORATION
Wilmington 99, Delaware

Builders of Special Machines a Specialty. Facilities Available for Production. Quantities of Small and Medium Precision Parts.

Equipment List on Request

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: **"OPPORTUNITIES"** :EQUIPMENT :USED OR RESALE

MACHINE WORK WANTED

Open facilities for long and short run jobs for Brown & Sharpe automatic screw machines and all sizes turret lathes.

PHOENIX SCREW MACHINE CO.
510 SOUTH AVE., GARWOOD, N. J.
Westfield 2-0819

WANTED
General Superintendent

to take charge of plant manufacturing small gears and precision parts. Must have engineering and practical shop background and be familiar with all phases of manufacturing, inspection and heat treating. Plant employs 250 to 300 people and is located in Middle West. Good opportunity for right man. Give age, nationality and full details regarding experience and training, also give salary expected.

ADDRESS
P-7186, AMERICAN MACHINIST
330 W. 42nd ST., NEW YORK, N. Y.

ENGINEER WANTED

Manufacturer of hand tools in Minneapolis area wants Methods and Design Engineer. Must be familiar with screw machine, drill press, milling machine and drop forging. Must have practical experience in die and jig design. Must be 30 years of age or over. Good opportunity for advancement with growing company.

P-7140 AMERICAN MACHINIST
520 N. MICHIGAN AVE., CHICAGO 11, ILL.

INDUSTRIAL DIAMOND SALESMAN

Profitable opportunity for experienced diamond man or successful manufacturer's agent who wants a top quality line; includes loose diamonds, diamond tools, hones, wheels and powder. Strong demand makes this an ideal time to start. *Write now. Open territories include Rochester, Michigan and Ohio.*

S.W.-7265, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

MACHINERY SALES MANAGER

One of the country's leading metal-working machinery dealers located in Chicago offers a splendid opportunity for an aggressive, experienced man to organize and super vise its sales department. Only a capable man with a successful machinery background will be considered. Send complete history, background, age, salary and photo which will be returned. All correspondence, discussions held in strictest confidence by top executive of the company.

P-7281, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

EXCEPTIONAL OPENING FOR

SALES ENGINEER

to cover Mid-West Metalworking Industry

Selling Experience Desirable But Not Essential

Nationally known manufacturer of fastening devices wants man to advise customers on applications—not take orders—working in midwest with headquarters preferably in St. Louis or Kansas City. Salary to be commensurate with experience.

Requirements: Varied knowledge of metalworking production gained by plant work or selling; ability to travel extensively away from home. Write in detail about background. Interview arranged at New York headquarters; expenses paid.

S.W.-7307, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

REPLIES (Box No.):
Address to office nearest you.
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

TOOL DESIGNER—Chattanooga. Should have minimum of five years experience with single and multiple spindle screw machine tools. Some jig and fixture experience also desirable. Write full details of qualifications. Enclose photo (nonreturnable). P-7142, American Machinist.

SELLING OPPORTUNITIES OFFERED

WANTED A person with connections who can secure work for old established manufacturers of special machinery and tools. Also have own wood or metal pattern shop. Commission or share of profits without investments. RW-7178, American Machinist.

DIAMOND TOOL Company has available several territories for representatives on commission basis. Might be handled in conjunction with other line. RW-7238, American Machinist.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500-$35,000. If you are considering a new connection communicate with the undersigned. We offer the original personal employment service 38 years recognized standing and reutation. The procedure of highest ethical standards is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details. R. W. Bixby Inc., 266 Dun Bldg., Buffalo 2, N. Y.

(Continued on page 253)

WHAT WILL YOUR SALES BE IN 1949?

Concerned about them? Exports may be the answer. As follow up of growing export program under European Cooperation Administration; officer of this established well-financed export firm is leaving shortly for Europe to set up a branch office. Without obligation you can confer respecting your ideas, and problems, at your own office. He will call, if you write or wire.

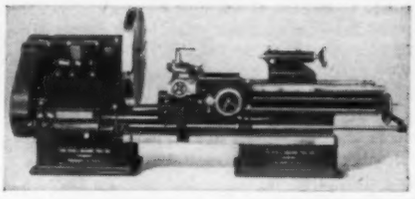
INTERNATIONAL COMMODITIES CORP.
808 BROADWAY NEW YORK 3, N. Y.

BUY FROM STOCK
Telephone
MAIN 6347-6348

FALK
MACHINERY COMPANY

18 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented



Nebel 20"-40"x8' Geared Head Quick Change Gear Extension Bed Gap Lathe. 3/60/220 volts motor driven. Taper Attachment, faceplates, chuck, tailstock, plus Hexagon Turret with power feed. Immediate delivery.

ENGINE LATHES

36"x30' LeBlond Geared Hd. Motor Dr.
32"x16' Bridgeford, Geared Head, M. Dr.
28"x10' Davis Quick Change Gear
26"x18' Bridgeford, Geared Head, M. Dr.
25"x14' LeBlond Motorized
24"x18' American Q.C.G. Grd. Hd. 11' centers, Taper Attach. Motor Dr. Equipment
24"x14' Lodge & Shipley, Motorized
24"x16' American Motorized
24"x12' Putnam, Quick Change Gear
24"x10' LeBlond, Quick Change Gear
21"x18' LeBlond, Motorized
20"x11' Schumacher-Boye, Q.C.G.
20"x10' American, Q.C.G. 72" centers
20'x10' Hendey, Q.C.G. motor dr.
20"x8' Lodge & Shipley, Q.C.G. M. Dr.
18"x10' American Geared Head
18"x8' Davis Q.C.G. 42" centers, equipment
18"x8' Lodge & Shipley, geared head
18"x8' Hendey Q.C.G. 49" centers
18"x7' Lehman, Q.C.G. M. Dr.
18"x6' American, Geared Head, M.D.
16"x8' Hendey Q.C.G. M. Dr.
16"x6' Lodge & Shipley Geared Head
14"x8' Rockford, Q.C.G. Collets
14"x6' LeBlond, Q.C.G. M. Drive
14"x6' Mulliner-Endlund, M. Drive
14"x6' Hendey, Q.C.G. M. Drive
14"x6' Rockford, Q.C.G. M. Drive
13"x5' South Bend Q.C.G. 30" centers
12"x30" American Wood Spinning
12"x5' Sidney, Geared Head
12"x5' Hendey Q.C.G. M. Drive
12"x5' Hendey Motorized. Taper & Collets.
12"x5' Sebastian Q.C.G. Grd. Hd.
12"x5' Mulliner Motorized. Taper Att.
12"x3' Craftsman, Bench, M. Drive
12"x18" Porter-Cable Carbo-Lathe
11"x4' Sidney, Q.C.G. Floor Type

TURRET LATHES

Morey #2 Geared Head 1" Cap., M. Dr.
Simmons Microspeed 1" Cap., M. Dr.
Oster #601 Hand Screw Machine 1½" cap.
W-Swasey #4 Univ. 1½" cap., M. Dr.
Jones & Lamson #3 Univ. Bar Feed, 1½"
W-Swasey #3 Univ. 1½" cap., M. Dr.
Gisholt #4 Univ. 2" cap., M. Dr.
W-Swasey #2A Univ. 2½" Cap., M. Dr.
Bardons & Oliver #7, Univ. 2½" Cap.
W-Swasey #3A Univ. 3½" cap., M. Dr.

Buffalo #0 Bending Rolls. Pinch Type, motor driven. With formers for bending angles, rounds, squares, pipe.
Buffalo #1 Wrapping Rolls. Motor driven. Capacity—3½x3/8x9
Niagara Initial Type. 12'x⅛" capacity.

METAL ROUTERS

Onsrud Double Spindle Radial Arm #A2DD 108" Arms with frequency Converter for 3/60/220
Onsrud #W-255 Universal Heavy Duty Single Spindle Router, with all steel table 54"x36" with T-slotted edges.

Porter-Cable 12"x18" Mechanical CARBO-LATHE. Semi-Automatic. 63 spindle speeds, 95 to 1130 r.p.m. Collet capacity —1". 3/60/220 volts motor drive.

GRINDING MACHINES

J & L #TG-615 Automatic Thread, M. Dr.
Norton 6x18 Vert. Surface, Excello Spindle
Norton 6x18 Horiz. Surface, Excello Spindle
Brown & Sharpe #2 Auto. Surface, 6x18
Pratt & Whitney 14x36 Vertical Surface
Blanchard #16, 30" Vertical Surface
Thompson Hydraulic Horiz. Surface
Abrasive Automatic Surface, 22x8
Reid #2 Automatic Surface, 6x18
Norton Hydraulic Horiz. 6x36
Heald #25 Rotary Surface
New Leach 6x12 Horiz. Surface, 3/60/220 volts
Brown & Sharpe #2 Face, motorized
Rivet #3 Internal, Cone driven
Heald #70 Internal, Belt drive
Heald #60 Internal, Belt drive
Norton #2 Univ. Tool & Cutter, Belt Dr.
Cincinnati #1½ Univ. Tool & Cutter, Belt Dr.
Oakley #3 Tool & Cutter, Belt Dr.
G & Livingston #4 Tool & Cutter
Cincinnati #2 Tool & Cutter, M. Dr.
Cincinnati "Monoset" Tool & Cutter
Cincinnati #2 Centerless, M. Dr.
Gorton Dble. End Disc, 18" dia. discs
Besley Dbl. End Disc, 30" dia. discs
Greenfield #12 Internal Hydraulic
Cincinnati #2 Univ,. Cylindrical 6x36
Brown & Sharpe #10 Cylindrical 6x18
Brown & Sharpe #11 Cylindrical 10x30
Brown & Sharpe #4 Univ. Cylindrical 12x60
Brown & Sharpe #5 Plain Cylindrical
Oliver of Adrian #51 Drill Grinders

AUTOMATICS

No. 0 & No. 00 Brown & Sharpe
No. 0 Brown & Sharpe Automatic Cutoff
#2 Brown & Sharpe High Speed Automatic. Turner Drive.
1—1¼" Cone 4-spindle Automatic M.D. Threading Spindle
Cleveland Model "A" 3¾" Single Spindle. Motor driven.

PUNCH PRESSES

Caldwell 200 tons Horiz. Hydr. Wheel Press.
Ferracute #86 Wide Frame, motor driven. 61½" between housings. 13¾" stroke.
Ferracute No. EG52 Coining Press. 150 tons.
General Flexible Power Press. 8 tons, M. Dr.
Stiles O.B.I. 14 tons, 1½" stroke.
Michigan O.B.I. 36 tons cap. 2" stroke. Wide Ram, wide Bed. Motor driven
Bliss No. 68C Dbl. Action, Gap Frame.
Lucas 15 tons, Power Arbor Press. M. Dr.
Hub O.B.I. 15 tons, 2" stroke, M. Dr.
Tompkins & Johnson Power Arbor Press.
McCall No. 4 O.B.I. 2½" stroke, 25 tons.
NEW Johnson O.B.I. Presses. All sizes.
Bliss #305 Geared S.S. Single Action
Nilson 56 tons S.S. Dbl. Crank 3-Die Transfer Press
Bliss #18, #20, #20B, O.B.I. Motorized

SHEARS

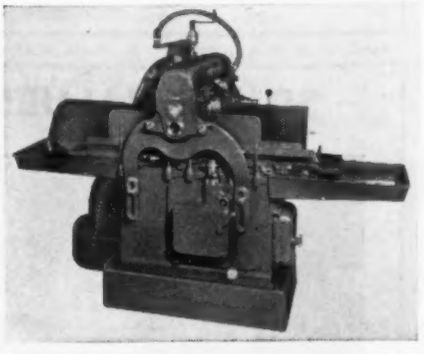
Bliss #109 Slitter, 10 ga. cap.
Pexto #571 Slitter, 3/16" cap.
Wais & Roos 10' x ¼", 15' gap.
NEW Famco 36"x18 ga. Squaring
Pexto Foot squaring 30" x 22 ga.

GEAR CUTTERS

Fellows #72 High Speed Gear Shaper, Internal & external, Motor driven
Fellows #7 High Speed Gear Shaper, External, Motor driven
Brown & Sharpe #3—36 Automatic Gear Cutter, 36" dia. Motor driven
Brown & Sharpe #34 Gear Hobber. 5" dia. Motor driven
Barber-Colman #3 Gear Hobber, 5" dia. 7" face, Motor driven
Whiton #1 Automatic Gear Cutter, 34" dia. 7" face, Motor driven
Adams #1 Gear Hobber, 14" dia. 6" face, Motor driven

MILLING MACHINES

Vernon #0 Hand, Late Type, M.D.
Nichols Hand, Late Type, M.D.
Sundstrand #0 Rigidmil, M.D.
Whitney #6 Hand, Cone Drive
Hardinge B.B. Vertical, Bench
Bickett #1 B.B. Vertical, Bench
Ames Universal Horiz. Bench
Becker #5C Vertical, Cone Dr.
Knight #1½C Vertical
Cincinnati #3 & #4 Vertical
Cincinnati #2 Univ. Horizontal
Cincinnati #3S Univ., Horizontal
Cincinnati #3, #4, #5 Pl. Horiz.
Cincinnati #2M Univ. Horiz.
Brown & Sharpe #12 Production. 18" Autom.
Brown & Sharpe #12 Production. 24" Autom.
Brown & Sharpe #0, 1, 1Y Horizontal
Brown & Sharpe #2 Univ. Horiz.
Brown & Sharpe #1D Univ. Horiz.
Brown & Sharpe #3 Univ. Horiz.
Kempsmith #1, #2 Plain Horiz.
Cincinnati 18" Mfg. Plain
Milwaukee #2K Vertical, M. Dr.
Milwaukee #3K Vertical, M. Dr.
Milwaukee #1½ Dbl. Overarm, Horiz.
Milwaukee #2B Dbl. Overarm, Horiz.
Milwaukee #2B Universal Horiz.
Milwaukee #3B Plain Horizontal
Pratt & Whitney #2 Duplex, Motorized
Van Norman #2 Duplex, Motorized
Cincinnati #0-8 Vertical, M. Dr.
Cincinnati #0-8 Plain Automatic
Cincinnati #0-8 Rise & Fall
Cincinnati #2-18 Plain Automatic



Cincinnati #2-18 Automatic Horizontal Milling Machine. Late Type, Motor driven with motor and controls. Motor driven coolant system. NINE AVAILABLE.

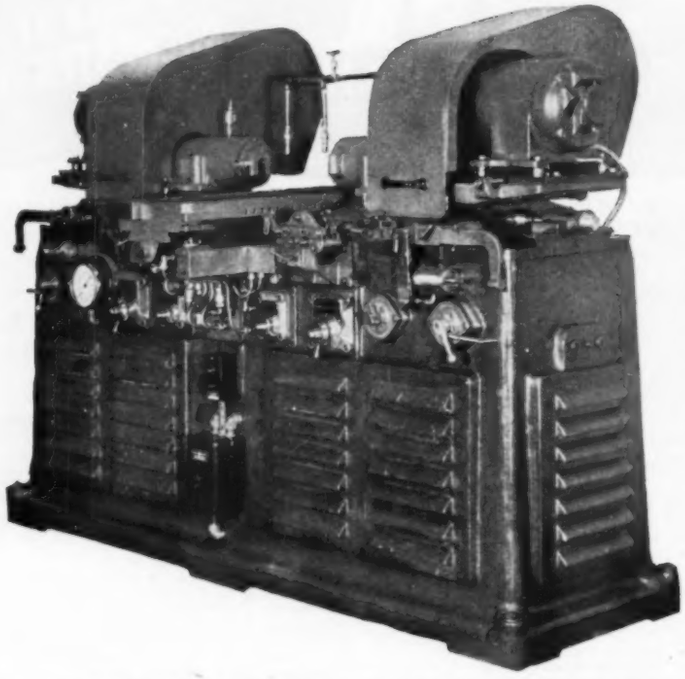
SHAPERS & PLANERS

Shaper—Logan 7" Horizontal. NEW
Shaper—Machinery Sales 16", motorized
Shaper—Gould & Eberhardt 16", motorized
Shaper—Smith & Mills 16", motorized
Shaper—Smith & Mills 16" Universal
Shaper—Potter & Johnston 16", Universal
Shaper—Gould & Eberhardt 18" B.G. Crank
Shaper—American 24" crank, motorized
Shaper—Columbia 32" B.G. Crank. Gearbox
New Haven 12" Slotter, motorized
Planer—Whitcombe 24x24x6 motorized
Planer—Shaper—Niles-B. Pond 20x20x24
Planer—Betts 72x60x30 Modern 4-Head
Planer—Betts 72x60x25 Modern 4-Head
Planer—Betts 122x72x34 Modern 4-Head

DRILLING MACHINES

American 8' Triple Purpose Radial, M. Dr.
Cinci-Bickford 6' Arm, 15" col. Radial
Cinci-Bickford 5' Arm, 13" col. Radial
American 4' Triple Purpose Radial, M. Dr.
Fosdick 5" Arm 14" col. Radial
Demco 4-Spindle Drill #2 M. T. M. Dr.
Natco #12, 20 Spdle. Multiple, 3/16" cap
Minster #2D Single Spindle Upright Heavy Duty 2½" cap. Compound Table. Motorized
Canedy-Otto 21" Single Spdle. Late Type
Cinci-Bickford 21" Drilling & Tapping, #3 m.t.
Buffalo Forge #2MS Drill. Late Type
Barnes 22" Backgeared Upright Single Spdle.
Leland-Gifford #2MS, 2-Spindle Upright
Edlund #2B, 4-Spindle Upright, #2 m.t.
NEW Buffalo Forge #15, #18 Single Spdles.

EMERMAN OFFERS FROM STOCK



NEW

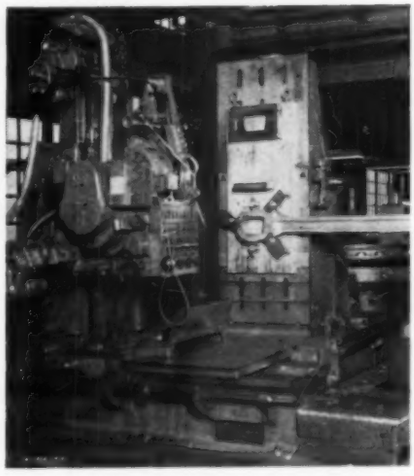
BRIDGEPORT HYDRAULIC DUAL SPLINE MILLING MACHINES TYPE HD-SM-1

Table travel 0" to 12"
Distance from table to center of splines 4"
Maximum depth of cut—using both spindles 6"
Maximum depth of cut—using one spindle 3"
Maximum length of cut—plus diameter of cutter 12"
Spindle feeds 0" to .030"
Spindle speeds, 290-550-1025-1925
Number of table feeds per length of stroke—infinite
Work surface of table 6" x 32"
Maximum cutting diameter ¾"
Independent spindle adjustment 2"
Maximum between ends of spindles 12"
Minimum between ends of spindles 0"
Table strokes per minute 0" to 110"
Position adjustment of table 12"
Hydraulic feed to table & heads. Vickers pump & control
Driven by 3 HP General Electric 3 Phase 60 Cycle 220/440 Volt 1725 RPM Motor
Electric motors for spindle drive 2—1½ HP Diehl, 3 phase 60 cycle 220/440 Volt 1140 RPM Motors
Coolant system electric motor ¼ HP
Net weight of machine 3,600 lbs.

EMERMAN MACHINERY CORP.

875 W. 120th ST.
CHICAGO 43, ILL.

SOUND VALUES—"GUARANTEED"



MODEL BG1-482 PRATT & WHITNEY KELLER TYPE THREE DIMENSIONAL DUPLICATING MACHINE. Complete with automatic and profile spindles, angle fixtures, complete electrical controls including motor generator set. Machine new in 1944, practically new condition.

16"x54" LeBLOND Toolroom Lathe, 1943
20"x10' AMERICAN High Duty 12 sp. Timken Geared Head Lathe, 15 HP, M.D.
30"x10' AMERICAN 12 Speed G.H. Lathe
48"x28' NEW HAVEN 8 Speed G.H. Lathe, 20' centers, M.D.
No. 3 BARDONS & OLIVER Turret Lathe, 1943
No. 4 GISHOLT Turret, bar and chuck
No. 2 K. & T. Universal Mill, complete equipment
No. 3 CINCINNATI Universal Mill, M.D.
No. 3 CINCINNATI Vert. Mill, dial type
No. 4 CINCINNATI Plain Mill, dial type
20/24" GOULD & EBERHARDT Industrial Universal Shaper—1944
32" OHIO Heavy Shaper, power downfeed
36" OHIO Extra Heavy Duty Shaper —1943
6"x18" CINCINNATI Cyl. Grinder, infeed 1944
12" GLEASON Bevel Gear Generator, 1941
3' AMERICAN Triple Purpose Radial, M.D.
6' — CINCINNATI-BICKFORD Radial, 15" column, AC motor on arm
No. 5 NEWARK Gear Hobber

O'CONNELL MACHINERY CO.

1825 NIAGARA STREET BUFFALO 7, N. Y.

UNUSUAL VALUES

Milling Machines—No. 1, Universal, No. 1 American (new) plain, No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 3—26" Gould & Eberhardt 42".

Grinders—Cylindrical B & S No. 11, Planer type 16"x36", Surface 13"x63", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10—16"x6', 8', 10'—18"x6', 8', 10'—26"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized
Large stock 19" and 18" bench and floor type.

Planers—Single head 24"x6', 24"x8', 26"x8'.

Shapers—16", 20", 24", B.G. crank.

Turret Lathes—J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".

SPECIAL—New totally enclosed dust proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

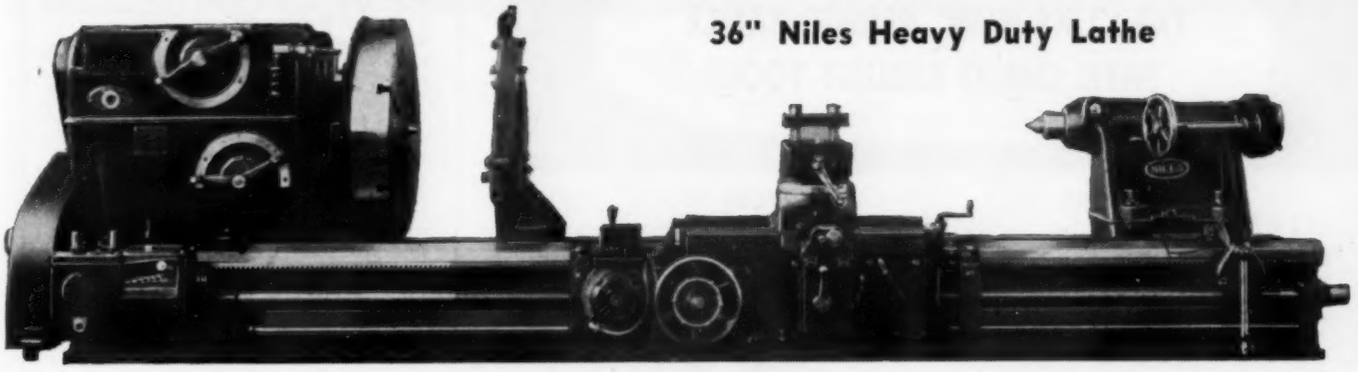
Drill—Foote-Burt No. 25 24" Hi Duty 3" capacity in steel. Motor attached.

PATTERN MAKING MACHINERY—42"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.

P. O. Box 88, Columbus 16, Ohio

THE SIGN OF QUALITY
THE MARK OF DEPENDABILITY
EASTERN REBUILT MACHINE TOOLS



36" Niles Heavy Duty Lathe

ENGINE LATHES

10x20" centers Monarch Model EE Geared Head, m.d., 1942 machine
10x24" Logan, motorized
13x30" Pratt & Whitney Model B Geared Head, m.d., taper
13x48" Pratt & Whitney Model B Geared Head, m.d.
14x30" Lodge & Shipley Selective Head, m.d., latest
14x54" Bradford Geared Head, m.d., taper, late
14x6' bed Hendey Geared Head, m.d., taper
14"x6' LeBlond, cone, motorized
14"x6' Pratt & Whitney, cone, taper
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
14"x8' American Geared Head, m.d.
14"x8' Pratt &Whitney, cone
15"x6' LeBlond Geared Head, m.d., late
16"x36" centers Pratt & Whitney Geared Head, m.d., taper
16"x6' Bradford, cone, motorized, taper
16"x6' bed Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, motorized, taper
16"x6' Lodge & Shipley Selec. Head, m.d.
16"x30" centers Monarch Geared Head, m.d.
16"x10' bed Hendey Yoke Head, motorized, taper
17"x6' LeBlond Geared Head, m.d.
18"x52" centers American Geared Head, m.d., taper
18"x5' bed LeBlond Geared Head, m.d.
18"x6' Hendey Yoke Head, m.d.
18"x7' Hendey Geared Head, m.d., taper
18"x8' American Geared Head, m.d.
18"x8' American Geared Head, m.d., taper
18"x8' Hendey Geared Head, m.d., taper
18"x8' Champion, cone
18"x8' Lodge & Shipley Geared Head, m.d.
18"x8' Lodge & Shipley, cone, motorized
18"x8' Whitcomb-Blaisdell Geared Head, m.d.
18"x10' Cincinnati, cone
18"x10' Lodge & Shipley Geared Head, m.d.
19"x8' LeBlond Geared Head, m.d., taper
19"x10' LeBlond Geared Head, m.d.
20"x8' American Geared Head, m.d., taper
20"x8' Cisco, cone, motorized
20"x10' Sidney Geared Head, m.d.
20"x11' Lehmann Geared Head, m.d., taper
21"x12' LeBlond Geared Head, m.d., taper
21"x18' LeBlond, cone
22"x70" centers Greaves-Klusman Geared Head, m.d., taper
22"x8' Lodge & Shipley, cone
23"x12' LeBlond Geared Head, m.d., taper
24"x10' American, cone, taper
24"x10' Greaves-Klusman Geared Head, m.d., taper
24"x10' Hendey Geared Head, m.d.
24"x10' Lodge & Shipley, cone, motorized
24"x12' Bridgeford Geared Head, m.d., taper
24"x12' LeBlond, cone, motorized
24"x12' Monarch Geared Head, m.d., taper
24"x24' American, cone, motorized
25"x10' bed LeBlond, cone
26"x12' Betts-Bridgeford Geared Head, m.d., taper
30"x12'6" Niles-Bement-Pond, m.d., taper
30"x13'6" Niles-Bement-Pond, m.d.
32"x12' Lehmann Hydratrol Geared Head, m.d., taper, p.r.t., late
36"x12' Lehmann Hydratrol Geared Head, m.d., taper, late
36"x32' centers Putnam Geared Head, m.d., has 2 carriages
36"x36'6" bed (28' centers) Niles Heavy Duty, m.d., p.r.t., geared head, 2 carriages, very late type
50"x204" centers LeBlond H. D. Geared Head, m.d., taper, p.r.t., 1942 machine

PLAIN MILLING MACHINES

No. 1M Cincinnati, m.d.
No. 1A Milwaukee, m.d., in base
No. 1½, 2, 3 Cincinnati, cone
No. 2B Brown & Sharpe, m.d. in base, 1942 machine
No. 2 Cincinnati High Speed Dial, m.d. in base, 1942 machines (4)
No. 2MH Cincinnati, m.d. in base, late
No. 2HL Milwaukee, m.d., in base, latest
No. 2 Rockford Plain, m.d.
No. 3 Kempsmith Plain Maxi-Miller, m.d., Timken
No. 3B Milwaukee, m.d.
No. 3 Van Norman Duplex, s.p.d.
No. 4 Cincinnati H.P., m.d., p.r.t.
No. 4 Kempsmith Maxi-Miller, m.d.
No. 4 Ohio, cone
No. 5 Cincinnati, rect. overarm, m.d.
No. 5 H.D. LeBlond, s.p.d.
No. 5B Heavy Brown & Sharpe, m.d.
No. 3B Brown & Sharpe, m.d. in base, high speed, late

UNIVERSAL MILLING MACHINES

No. 1B Milwaukee, m.d.
No. 2 Cincinnati Medium Speed Dial, m.d., late
No. 2 Cincinnati, cone
No. 3 Brown & Sharpe, cone
No. 3 Kempsmith, cone
No. 4A Brown & Sharpe, m.d.
No. 4 H.P. Cincinnati, m.d.
No. 4G LeBlond, s.p.d.

HAND MILLING MACHINES

Atlas Model MF Bench, m.d.
No. 1 Standard, m.d.
No. 2 Productomatic, m.d.
No. 3 Garvin, m.d.
No. 6 Whitney, m.d.

BROACHING MACHINES

No. 4 Oil Gear Type XA, 64" stroke, m.d.
No. 75 H.P. LaPointe Hydraulic, m.d., 150" stroke, 37½ tons cap.
No. 4 LaPointe of Hudson, m.d.
Cincinnati Mill Broach, m.d., 10" spindle, new

BALL BEARING DRILLS

No. ½, 1, 2 Avey, m.d.
No. 1B Edlund, m.d., new
No. 5M—16" Fosdick, m.d.
2 spindle No. 3 Avey, m.d., p.f.
2 spindle 21" Canedy-Otto, m.d., No. 4 Taper
3 spindle No. ½ Avey Heavy, m.d., latest
4 spindle No. 2 Avey, m.d.
6 spindle No. 2B Edlund, m.d.
6 spindle Henry & Wright Class B, m.d.
6 spindle Leland & Gifford, direct m.d. on each spindle

HORIZONTAL DRILLS

No. ½Bx50 Pratt & Whitney 2 spindle Gun Barrel Rifling Machine, latest
No ½Bx30" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d., latest
No. ½Bx50" Pratt & Whitney 2 spindle Deep Hole Drill, m.d., latest
No. 1Bx50" Pratt & Whitney as above
No. 1½x105" Pratt & Whitney as above
No. 1 Pratt & Whitney, older type
No. 1½ Pratt & Whitney, older type
No. 1½Bx105" Pratt & Whitney 2 spindle Hydraulic Gun Barrel Rifling Machine, 105" capacity, latest type

HORIZONTAL DRILLS (Cont.)

Pratt & Whitney Rifling Machine, belt, older type
5 spindle Detroit Semi-Automatic Hor. Drill, belt
No. 6 Barnes Twin Spindle Hydraulic Honing Machine, m.d., 1943 machine
2 spindle No. 410 W. F. & John Barnes Deep Hole Drill, m.d., latest

MULTIPLE SPINDLE DRILLS

No. 3 Baush, m.d., 16x30" head, equipped with 15 spindles No. 2
No. 3 Baush, m.d., drilled for 34 spindles, equipped with 12, No. 2
P7 Baush Hydraulic, 20x30" head, bored for 22 spindles, equipped with 12
D13H Natco, 18x12" head, bored for 24, equipped with 6 spindles, tapping
No. 16 fixed center Foote-Burt, m.d.
3 spindle 24" Barnes All Geared Self-Oiling, m.d.
3 spindle 12" Rockford Gang, m.d.
4 spindle Foote-Burt Rail, m.d., No. 4 Taper
4 spindle Niles-Bement-Pond H.D. Rail, No. 5 Taper

GEAR HOBBERS

Model T Barber-Colman, m.d., latest
No. 12H Gould & Eberhardt Universal, m.d.
No. 36H Gould & Eberhardt, with auto. infeed for worm gears, m.d.
No. 34 Brown & Sharpe Spur, m.d.
No. 44 Brown & Sharpe Spur & Spiral, m.d.
48" Cleveland Hobber, m.d.

GEAR CUTTERS

No. 3—26" Brown & Sharpe, m.d.
No. 4—48" Brown & Sharpe, m.d.
3" Gleason Straight Bevel, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.d.
8" Gleason Mfg. Type Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
12" Gleason Straight Bevel, m.d.
Cincinnati Gear Burnisher, m.d.
No. 1 Brown & Sharpe Spur Gear Tester
National Broach & Machine Red Ring Gear Speeder, m.d., 10" size
Cross Gear Tooth Rounder, m.d., 9" cap.
Gleason Gear Tester, m.d.

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d., Filmatic Spindle, 1942 to 1945 machines (3)
No. 2 Cincinnati, m.d., older type spindle (12)
Cincinnati Valve Seat Grinder, cap. 3/8" valve stems, m.d.

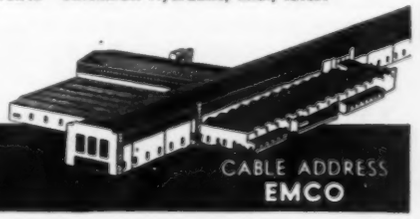
CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d., 18" spindle
No. 55 Heald, m.d., 24" spindle
No. 73 Heald Airplane Cylinder, m.d., brand new

UNIVERSAL CYLINDRICAL GRINDERS

12x24" Cincinnati Self-Contained, m.d., Filmatic Spindle
No. 2—12x30" Browne & Sharpe, belt
12x30" Landis Hydraulic, m.d., latest
12x36" Cincinnati Self-Contained, m.d.
12x36" Cincinnati, belt
12x48" Cincinnati Hydraulic, model ER, m.d., latest
12x48" Norton, m.d., 1942 machine
16x48" Cincinnati, belt
18x48" Cincinnati Hydraulic, m.d., latest

We carry an average stock of 2,000 machines in our 11 acre plant at Cincinnati. Visitors welcome at all times.



THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS EMCO

THE "LIKE NEW" PERFORMANCE WITH CIMCO REBUILT TOOLS

AUTOMATICS
#1 B & S Hand Screw Machine
#4 B & S Hand Screw Machine

ALL SIZES NEW HACK SAWS

DRILLS—RADIAL
5'-15" Column Carlton Radial Drill
2'-6' Plain Radial Drills
7' American
7' Cincinnati Bickford, gr. box
4' Carlton, gear box
6' American Triple Purpose
5' Foodick Plain, Gear Box

GRINDERS—PLAIN
#12 Brown & Sharpe Plain Grinder
10"x24" Landis C Hyd. Univer. Grinder
No. 2 Landis Univ. belt drive
16"x72" Landis, belt drive
18"x72" Cincinnati, latest type
20"x240" Landis, M.D.

GRINDERS—TOOL & CUTTER
#51 Oliver tool grinders
#13 Brown & Sharpe Cutter Grinding Machine
#2 Cincinnati Tool & Cutter Gr. New 1942

GRINDERS—SURFACE
6"x18" Thompson Hydr. Surface grinder
14"x18"x72" G & L Model A Hyd surface grinder
12"x48" Cincinnati Grinder

LATE TYPE
20" Cincinnati Univ. Shaper

EXCEPTIONAL BUY
18"x54" Lodge & Shipley Lathe, late type.

LATHES
#6 LeBlond Multi-cut
10" Rivett Bench Type
14"x5' Lodge & Shipley Belt dr.
14"x6' LeBlond Gr. Hd.
14"x6' Lodge & Shipley cone belt dr.
16"x6' American Belt drive
16"x8' American Screw Cutting Engine Lathe

LATHES (Cont.)
18"x6' Boye & Emmes Belt drive
18"x9' L & S Bowl hd.
19"x8' Sidney Lathe Bowl Type
20"x10' Lodge & Shipley Belt dr.
24"x12' American 8 Sp. Gr. Hd.
24"x22' Lodge & Shipley Gr. Hd.
25"x12' LeBlond Gr. Hd.
36"x36' American Geared Head
30"x10' Centers Nile Timesaver

TURRET LATHES
21" Gisholt Turret Lathe
3L Gisholt Turret Lathe
#4 Millholand
2¼x24" J & L Flat turret
3½x32" J & L Flat turret
36" Bullard Univ.

MILLING MACHINES
Sundstrand 00 Hydraulic
#118 Van Norman Production Millers
28" Cincinnati Semi-Automatic
New Burke Hand Millers
1½ BS Double overarm miller
3S Cincinnati Plain
2B—B & S motor in base
#2M Cincinnati Vert. Mill
#4 Cincinnati Heriz. Dial Type
#3 Cincinnati Medium Speed Dial type, Vert.
40" Ohio Tilted Rotary Miller

UNUSUAL BARGAIN
#4 Cincinnati Vert. Miller, Late Type

SPECIAL
#3—12 Arter Surface Grinder

PLANERS
30"x30"x20" Gray Planers
42"x42"x20" Cincinnati Planer
72"x72"x20" Niles Bement Pond
42"x42"x20" Cincinnati Hypo

SHAPERS
15" Smith & Mills
20" G & E Shapers
20" Ohio Belt Dr.
24" Cincinnati Belt dr.
24" Petter & Johnsen

GUARANTEED MACHINERY

Cincinnati Machinery Co., Inc.
219 East Second Street
Cincinnati 2, Ohio

FOR SALE LIKE NEW

CINCINNATI INTERNAL & EXTERNAL HYDRAULIC UNIVERSAL GRINDER 12" x 36" WITH FILMATIC BEARINGS and PRATT & WHITNEY JIG BORER #2 ROWBOTTOM CAM MILLER.

CAPITOL MACHINERY CORP.
253 Centre St., New York 13, N. Y.

McDONALD
USED MACHINERY

G & E 24" Cin. 32" Shapers
Cleveland O.S. Planer 36"x8', 2 hds.
Abrasive No. 34 M.D. Vert. Surf Grinder
Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Monarch 20" grd. hd., M.D. Lathe 16 sp, Speeds Model "M"
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. No. 3-A
L & S 18x12' & 20'x10', 20'x8' Grd. Hd., M.D. & 28"x12' Lathes Monarch Model "C"
American 24x12 grd. hd. lathe, m.d. q.c.g.
American 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck
Cincinnati No. 2 Centerless Grinder
Colburn 60" & 72" Vert. Boring Mills
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd, S.P.D. Pl, Miller.
W. & S. No. 2A grd. hd, Univ. Turret Lathe, S.P.D.
Foster No. 2F Ostermatic grd. hd. Turret Lathe, M.D.

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

AUTOMATICS
No. 0G Brown & Sharpe
9/16" Acme Gridley Model R6
8" Bullard Multamatic
No. 2F Foster "Fastermatic"
⅞" x 1¼" Cone 4 spindle
1-1/16" Cleveland Model M
1⅝" New Britain Model 61
1⅞" Conomatic 8 spindle
2" x 18" Cleveland Model B
No. 454 New Britain 4 spindle
14" x 18" Monarch Mag-Na-Matic
14" x 19" Fay Automatic lathe
15" x 22½" Sundstrand Auto. stub
6" Sundstrand Auto. stub
1" Economy bolt head shaver

BORING MACHINES
Vernon vertical jig borer
No. 2 Pratt & Whitney vertical jig borer
2½" No. 25T Giddings & Lewis horiz.
3" No. 3A Universal horiz.
3", No. 31 Lucas
3¾" No. 32 Lucas horiz.
4" Model 42 Lucas precision horiz.
4½" No. 33 Lucas horiz.
7" Barrett cylinder borer
24" Bullard vertical turret lathe
42" Bullard vertical turret lathe
52" King
100 Niles-Bement-Pond vertical
No. 42 Heald Bore-Matic
No. 47A & 48A Heald Bore-Matic
No. 4HH Baker 2 way drill
Munson double end borer

DRILLS, MULTIPLE
6 or 8 spindle No. 11 Natco
12 spindle No. 39 Natco, rail type
12 spdl. No. 25 Baush hydr. rail
22 spindle No. 14 Natco
24 spindle No. 2 Baush
34 spindle No. 30 Natco
42 spindle No. B16 Natco
No. B4A Natco multiple or Hole tapper
Baush horizontal 2 way multiple

GRINDERS, INTERNAL
No. 72A5 Heald hydraulic with cross sliding head
No. 72A5 Heald plain with extended bridge
No. 72A3 Heald plain with cross sliding head
No. 72A3 plain with facing attmt.
No. 72A3 Heald Sizematic centerless
No. 72 Heald Sizematic internal
No. 75A Heald internal, cross feeding headstock
No. 75 Heald internal
Size IG Grenby internal gdr.
Majestic internal grinder
No. 42 Van Norman grinder
No. 16 A16 Bryant, internal and facing
No. 16 CP16 Bryant
No. 16-28 Bryant
No. 16-38 Bryant
No. 24-36 Bryant
MH1 Sav-way hydraulic feed internal

LATHES
14" x 6' Mulliner
14" x 6' Lodge & Shipley
14" x 8' American
15" x 6' Porter McLeod
16" x 30" centers Monarch
18" x 8' Rockford
36" x 16' Bridgeford

SHAPERS
6" Pratt & Whitney vertical
16" Gemco
16", 24" & 28" Gould & Eberhardt
20" & 24" Gemco universal, New.
24" Columbia universal

UPSETTERS
4" Ajax twin geared
2" Acme
700 ton No. 7C Ajax forging press

MILES MACHINERY CO.
SAGINAW, MICH.

LATEST TYPE NEARLY NEW MACHINES

AUTOMATIC SCREW MACHINES

BILLINGS & SPENCER #B2 Di-matic Cut Off
BROWN & SHARPE #4, 1½" capacity, Latest Type
BROWN & SHARPE #2G High Speed, Latest Type
CONOMATIC 2¾", 6 spindle, Latest Type
GOSS & DeLEEUW 8" Automatic Chucker, 5 spindles
NATIONAL ACME 9/16, 5 spindle, Model D, M.D.

BORING MILLS—Horizontal

CINCINNATI-GILBERT 3½" Bar, Floor Type, Latest
DETRICK & HARVEY 4" bar, Floor Type
GIDDINGS & LEWIS #25, 2½" Bar, M.D.
HEALD 48A, 49 Single End Bore-Matics, Latest
LANDIS #35, 3½" Bar, Floor Type, M.D.
LUCAS #41, 3" Bar, Table Type, Latest Type
NILES BEMENT POND 5", 6", bar, floor type, M.D.
UNIVERSAL 3" Bar, Precision Type, Latest Type

BORING MILLS—Vertical

BETTS 120" 2 swivel heads, AC, M.D.
BULLARD 36" Vertical Turret, Side Head, PRT, M.D.
BULLARD 61" Maxi-Mill, 2 heads, Motor Drive
BULLARD 16" 6 spindle, 8 spindle, Mult-au-matic, Type D Single Indexing, Latest Type
BULLARD 36" Vertical Turret "Spiral Drive" Latest
COLBURN 72" AC, M.D., 2 swivel heads, PRT
KING 62" 2 swivel heads, PRT, M.D.
NILES 38-44 Vert. Turret Side Head, PRT, M.D.
NILES 100" 2 Swivel Heads, PRT, M.D.

BROACHES

CINCINNATI 1-30 Duplex Vert. Hyd., Latest
CINCINNATI 3-30 Duplex Vert. Hyd., Latest

GRINDERS—Misc.

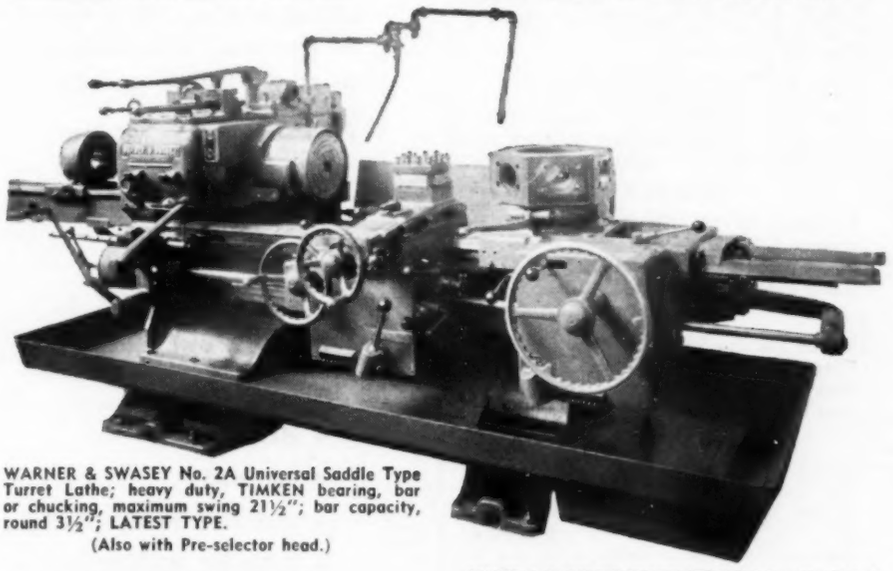
BRYANT #5, #16-16, #16-CP-16, #24, Internal Hydraulic, Latest Type
CINCINNATI #3 Centerless, Motor Drive
CINCINNATI #2 Centerless, "Filmatic", Latest
CINCINNATI Centerless Lapper, Model ED, Latest
CINCINNATI "Monoset" Tool & Cutter, Latest
COVEL #22 Universal Tool & Cutter, Latest Type
COVEL #91A Univ. Cutter and Tool, Latest
EXCELLO #46C Carbide, Latest
FITCHBURG 14"x25" Spline, Hydraulic, Latest
GLEASON #12 Tool Sharpener, Latest Type
HEALD 50, 70 Internal, Motor Drive
HEALD 75A, 72A3, 72A5, 74, 81, 70A Internal, Latest
HEALD #72A3, 72A5 Internal "Gagematic", Latest
JONES & LAMSON 6x15, 8x18, Auto. Thread, Latest
LANDIS 5" Oscillating, External, M.D.
PRATT & WHITNEY Contour, Latest
THOMPSON 6"x48" Auto., Round Broach, M.D.

GRINDERS—Surface

BLANCHARD #11—16 chuck, Latest Type
BLANCHARD #16—24" chuck, Motor Drive
DO-ALL Model G-10, 8"x24", Hyd., Latest Type
DO-ALL Model G-7, 9"x20", Hyd., Latest Type
GALLMEYER & LIVINGSTON #35, 8"x24", Latest
HEALD #22, 12" chuck, Rotary, latest type
HEALD 25A, 16" or 30" Chuck, Rotary, Hyd., Latest
MATTISON 14x24x72 Hydraulic, Latest Type
MATTISON 14x14x60 Hydraulic, latest type
NORTON 6"x18"—Hyd.—Latest Type
THOMPSON 12x12x24 Type B Hyd., Latest
THOMPSON 12x12x40 Type B Hyd., Latest

LATHES—Engine and Mfg.

AMERICAN 36"x360" centers, 2 carriages, M.D.
BRIDGEFORD 36"x24' centers, 2 carriages, M.D.



WARNER & SWASEY No. 2A Universal Saddle Type Turret Lathe; heavy duty, TIMKEN bearing, bar or chucking, maximum swing 21½"; bar capacity, round 3½"; LATEST TYPE.
(Also with Pre-selector head.)

GEAR CUTTING EQUIPMENT

BARBER COLMAN Type S Hobber, Latest Type
FELLOWS Model Z Gear Shaper, High Speed, Latest
FELLOWS 61, 615A, 7, 7A, 72, 75, 77, 61A High Speed Gear Shapers, latest type
FELLOWS Type 6Z2 Gear Shaper, High Speed, Latest
FELLOWS #13 LS Lapping, Latest Type
GLEASON 3", 12" Straight Bevel Generator, latest
GOULD & EBERHARDT 12H, 12HS Hobber, Latest
GOULD & EBERHARDT #36H Hobber, M.D.
PRATT & WHITNEY 10" Grinder, hyd., latest

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3 Universal, Latest
BROWN & SHARPE #5 Plain, 3x12, Latest Type
BROWN & SHARPE #20, 10x18 plain, latest type
CINCINNATI 6x18 plain Model EA, hyd., latest
CINCINNATI 16"x36", Plain, "Filmatic", Latest
LANDIS 4"x12", 4"x18" Type H, Plain, Hyd., Latest
NORTON 6"x18", Type C, Plain, Hyd., Latest
NORTON 10x72 centers Plain Type C Mech., Latest
NORTON 14x36" centers Plain Type C Hyd., Latest

JONES & LAMSON "FAY" 20"x25" Automatic, Latest
LEHMAN 16x30 hydratrol, Timken, latest type
LODGE & SHIPLEY 18"x72" centers, M.D.
LOSWING 4x60, 4x84, 8x60, 8x108, 5x34" centers, latest
MONARCH 22x456" centers Model CM, 3 car, Timken, Latest Type
MONARCH 12x54" centers Timken, Latest Type
MONARCH 10x20" centers, Model EE Timken, Latest
MONARCH 12x30" centers, Timken, Latest Type
MONARCH 24"x54" centers, geared, Motor Drive
NILES 42"x60", double head, M.D.
NILES 90x110 centers Standard Driving Wheel, M.D.
NILES 48x87' centers, Boring and Turning, M.D.
NILES 72"x62', centers, Boring and Turning, M.D.
NILES 30x50' Boring, Timken, Latest Type
PRATT & WHITNEY 16x30" centers, Timken, Latest
PRATT & WHITNEY 10x20" centers, Bench, Latest
PRATT & WHITNEY 16"x60' centers, geared, M.D.
PUTNAM 42"x25' centers, geared, Motor Drive
REED PRENTICE 16x24" centers, geared hd., M.D.
REED PRENTICE 16x48" centers, Geared Head, M.D.
SCHUMACHER & BOYE 24"x158" centers, geared, M.D.
SPRINGFIELD 16"x30" centers, Timken, Latest Type
SPRINGFIELD 14x43" centers Geared Head, M.D.
WARD HAGGAS & SMITH 18/36"x10' bed, Gap

LATHES—Turret

BARDONS & OLIVER #5, #7 Timken, latest
CINCINNATI ACME No. 1, Latest Type
FOSTER 4FU, Fastermatic, Timken, Latest
GISHOLT #3, 4, Univ., Timken, Latest
GISHOLT #1L, #2L, Universal, Timken, Latest Type
JONES & LAMSON #3, #5, Univ., Latest
MOREY No. 2G, No. 3, No. 4 Timken, latest
POTTER & JOHNSON 5D, 5D2E, Timken, Latest
WARNER & SWASEY 2A, Univ., Bar & Chuck, with or without "PRE-SELECTOR", Latest
WARNER & SWASEY #5, Univ., Timken Bearing
WARNER & SWASEY #1A, Univ., Latest Type

MILLING MACHINES—Mfg.

CINCINNATI 24" Duplex, Timken, Motor Drive
HALL Style D, Planetary, Latest Type
INGERSOLL 42x38x12' Planer type, Adjustable rail, 4 heads, AC, M.D.
INGERSOLL 32x30x12' Planer Type Slab, AC, M.D.
INGERSOLL 32x24x16' Planer Type 2 heads, AC, M.D
SUNDSTRAND Model 3A, Duplex, Timken, Latest Type
TAYLOR & FENN M-80 Duplex, Spline, Latest Type

MILLING MACHINES—Plain

BRIGGS Type A Hyd., 12" and 18" feed, Latest Type
BROWN & SHARPE #12, 24" feed, Timken, Latest
BROWN & SHARPE 2B, 3B, Timken, Latest
BROWN & SHARPE No. 2 Light Type, Timken, Latest
CINCINNATI #4 Timken Bearing, M.D.
CINCINNATI #3, 4, 5, Motor Drive
CINCINNATI 4-36 Hydromatic, latest type
CINCINNATI 0-8 Auto. rise and fall, Timken, Latest
KEARNEY & TRECKER #3, 4 heavy, Timken, latest
KEARNEY & TRECKER 1218 simplex, latest
KEMPSMITH #4 Maxi-Mill, Timken, latest

MILLING MACHINES—Vertical

CINCINNATI 0-8 Timken Bearing, Latest Type
CINCINNATI #2, 3, 4, Dial Type, Timken, latest type
GORTON 9J Super Speed, Latest Type
KEARNEY & TRECKER #3H Timken, Latest
REED PRENTICE 3VG with or without Hydraulic Duplicator, Timken Bearing, latest type

MILLING MACHINES—Thread

HANSON & WHITNEY 4"x9" centers, Latest Type
LEES BRADNER 12x24, Model HT, Latest Type
PRATT & WHITNEY 6x60" Type C, Latest Type
MOREY 12x30, 12x60, Latest Type

MILLING MACHINES—Universal

AMES 2½"x19" Table, Latest Type
BROWN & SHARPE #4A; M.D.
CINCINNATI No. 3, dial type, High Speed, Latest
CINCINNATI #4 High Power, Motor Drive
HARDINGE Model UM, Timken, Latest
KEARNEY & TRECKER #2 Heavy, Timken, M.D.
KEMPSMITH #4 Maxi-miller, Timken, Latest
VAN NORMAN #12 Timken, Latest Type
VAN NORMAN #3, Duplex, M.D.

PLANERS

DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
GRAY 36x36x8', 2 heads, maximum duty, DC, M.D.
NILES BEMENT POND 48"x48"x16', 2 heads, A.C., M.D.
NILES 48"x48"x16', 3 heads, Box table, A.C., M.D.
NILES 54x54x18' 4 Heads, Box Table, DC, M.D.
SELLERS 30' Plate Edge, Motor Drive

PRESSES

BIRDSBORO 325 ton, vert. hyd., Latest Type
CHAMBERSBURG 50 ton vert. hydro-pneumatic
CLEARING Type DS 1125-32 dbl., action 125 ton, Latest Type
CLEARING Type H-50-36-35 ton Vert. Hyd., Latest
FERRACUTE #DG-55, 75 ton drawing, Latest Type
HPM 37-ton Vertical Hydraulic, Latest
NILES 600 Ton Horiz. Wheel Press, M.D.

MISCELLANEOUS

AJAX 1½", 3½", Bolt Heading, Upsetting and Forging
BARNES #172, 306H, 307 Vertical Hone, Latest Type
CAMPBELL #401 Abrasive Saw, Latest Type
CLEVELAND 12"x16" Cutter Reliever, Motor Drive
GROB #08-20 Band Saw & Filer, Latest
MICHIGAN #170SA Cutter Reliever, Latest Type
PELLOW #2 Nut Slotter, Latest Type
PRATT & WHITNEY "Keller" Type G, Type BL2416—Latest Type
PRATT & WHITNEY ⅛Bx30, ⅛Bx50 2 spindle Deep Hole Drill, Latest
PRATT & WHITNEY ⅛Bx50 2 spindle Rifler, Latest
QUICKWORK ¾", 1" Capacity Rotary Shear, M.D.

Available for Prompt Shipment ***Most Built After 1941***

(Partial List) Over 2,000 Machine Tools in Stock. Your Inquiries Are Invited . . . Prompt Service Is Assured

MOREY MACHINERY CO., INC.

406 BROOME ST., NEW YORK 13, N. Y.
TELEPHONE: CANAL 6-5360
CABLE ADDRESS: WOODWORK, N. Y.

Make BOTWINIK NEW HAVEN Your Machinery Headquarters

Modern Machine Tools Immense Stock..... Ready to Ship

DRILLS

Baush M.D. Multi 12 Spd. #3 M.T.
Avey & Allen 3, 4, 5, & 6 Spindles
Fox M.D. Type 138C Multi Spdl. Late
Cincinnati-Bickford 3', 4', 5' & 6' Radials
Niles-Bement & Pond 6' Radial
Barnes No. 2—4 Spd. M.D. Hydram Late

GRINDERS

Norton 6"x10"x36" Surface
Norton 15"x17"x72" Surface
Hill-Acme 18"x96"x24" Surface
B. & S. Nos. 1, 2, 3, 4 Universal
Brown & Sharpe M.D. No. 5 Plain
Bryant Nos. 3B, 6 & 12 Internal
Cincinnati No. 2 & No. 3 Centerless
Cincinnati No. 3 Centerless Lapper
B. & S. No. 13 Univ. & Tool, Late Type
Blanchard No. 16—26" & 16A
Blanchard No. 16—30 Vert. Late
Heald No. 22—12", 16" Rotary Surface
Abrasive Nos. 33, 3 & 34 Surface
Heald Nos. 70A & 72A Internal
P. & W. 14" Vert. B. B., M.D.
Norton Type "C" 6"x18" M.D. Hyd. Cyl.
Norton 10"x24" M.D. Plain Cyl.
Landis "H" 4"x18" Plain Late

LATHES

Johnson 36"x36' B.G.L.C.G. Engine
Monarch 12"x30" CK (swings 18")
Hendey Plain 12", 14", 16", 18" Yoke Head
Hendey 12"x5' Y. H. Fact. M.D.
Hendey 24"x8' M.D. Q.C.G. Eng.
Hendey 12"x5' M.D. Geared Head
Amer. 18"x12' B.G. M.D. Engine
American 30"x16' G.H. M.D. Q.C.G. Eng.

MILLERS

K & T 2H D.O. M.D. Pl. Late
K & T 2H Vert. M.D. Sliding Hd. Late
Pratt & Whitney Keller Type BL-2416 Semi-Auto. Duplicator
Cin. No. 2 Univ.
K. & T. No. 2HL, No. 4H Plain
Milw. No. 3B Univ. D.O.
B. & S. No. 3A Universal
Cin. Nos. 2 & 3 Vert.
Van Norman No. 3SP Plain
B. & S. Nos. 3B Plain
Van Norman Nos. 0, 10 & 11 Duplex
P. & W. 8", 10" & 12" Auto.
Cincinnati 18" & 24" Production
P. & W. 6"x80" M.D. Thread
P. & W. 6"x14" Int. Thread
Cinn. No. 3 M.D. Plain
Potter & Johnston 2M Horiz. Auto.
Gorton No. 9J Vert. Late
B. & S. No. 21 Plain Auto.
Kempsmith No. 2G Plain Late
Kempsmith No. 4, Plain Max. Late

SHAPERS

Cincinnati 24" M.D. Crank Late
Hendey 32" M.D. Crank Late
Gould & Eberhardt 24" Crank
Gould & Eberhardt 16" M.D. Crank

PRESSES

Verson 500 Ton S.S. 8" St. M.D.
Bliss No. 304 M.D. S.S. Single Crank
Bliss No. 703 M.D. Flat Edge Trimming
Bliss No. 21 O.B.I. Power

SCREW MACHINES

B. & S. Nos. 00, 0, 2 Automatic
B. & S. Nos. 1 & 2 Hand
Gridley ⅞", 1¼", 1¾" & 2⅝" Model G
Cone 1¼", 3¼", 3½" & 4¾"—4 Spindle
Simmons No. 2 Micro-Speed
Foster No. 7 & 7B
W. & S. Nos. 1, 2, 2A, 3A Univ.

373 WELTON ST., NEW HAVEN 9, CONN.
EXPORT DEP'T: 44 G WHITEHALL ST., NEW YORK

Botwinik Brothers
INCORPORATED

National Bent Shank Nut Tappers Battery of ⅝" to 1" Machines.

Waterbury-Farrel Fdry. ⅝" and 1" D.S. S.D. Cold Headers, also Thread Rollers.

Fisher 5" Bar, Floor Type Boring Mill. New in 1942.

Niles, Bement, Pond 60"x60"x24' table 4-Head Planer, Rev. D.C. M.D.

Bliss Presses in all sizes up to 1,000 ton capacity.

Wire Working Machinery.

National Machinery Exchange
128-138 Mott St., New York 13, N.Y.

LATHES FOR SALE

BRIDGEFORD 36x24' centers Motor Drive
JONES & LAMSON "Fay" 20x25" Auto. Latest
LODGE & SHIPLEY 18x72" centers MD
LODGE & SHIPLEY #5 Duomatic Latest
LOSWING 8x60" centers Latest Type
NILES 30x50' boring "Timesaver" Timken Latest
NILES 26x48" and 72" centers MD
NILES 30x100" centers Motor Drive
NILES 42x39' centers Motor Drive
NILES 48x87" centers boring and turning MD
NILES 72x59' centers boring and turning MD
PUTNAM 42x25' centers geared MD
SCHUMACHER & BOYE 24x158" centers geared Motor Drive

HARRISON MACHINERY EXCHANGE, INC.
South 4th St. Harrison, N. J.
10 minutes from New York City—5 minutes from Newark, N. J.
Tel.: HUMBOLDT 2-5750, 2-5775

FOR SALE
MACHINE TOOLS

Immediately Available Due To Production Change-over

● Most of these tools have been purchased since the war and are in excellent condition. They are all still on our production line at our Cleveland plant. They can be purchased direct from us at substantial savings.

Included in this lot are:

- **ARBOR PRESSES**
- **AUTOMATICS**
- **BORERS**
- **BROACHES**
- **DRILL PRESSES**
- **GRINDERS**
- **HONERS**
- **LATHES**
- **MILLING MACHINES**
- **POWER PRESSES**
- **RADIAL DRILLS**
- **SCREW MACHINES**
- **WELDERS**

and many other items too numerous to list here. All tools offered subject to prior sale.

Write for Catalog

THE COLUMBIA AXLE COMPANY
8300 Baker Avenue
CLEVELAND 2, OHIO
Telephone: ATlantic 2400

SCARCE LATE MODELS

Consamatic 1¾" 8 spindle
TANNEWITZ BAND SAW #36M
3" UNIVERSAL HORIZONTAL BORING MILL
CHICAGO (D&K) #335 PRESS BRAKE, WITH DIES
DELTA SINGLE & MULTIPLE DRILL
Walker Turner Bench Drills ½"
Excelsior 21", Buffalo 18" Drills
GORTON DUPLICATORS 9J
GORTON ENGRAVERS 3U, 3L, 3Z, ME, CUTTER GRINDERS
BROWN & SHARPE #2B SURFACE GRINDER
Norton, Thompson 6"x18" Surf. Grind., Hydraulic Feed
G&L #18, 25, 35 Hyd. Surface Grinders
Abrasive #1½, 3B, 34 Surface Grinders
Heald #25A Rotary Surface Grinder
Gorton Cutter Grinders
Atlantic 6"x18 Surface Grinder
Brown & Sharpe #5 Cyl. Grinder
CINCINATI 12x36" UNIV. GRINDER, HYDRAULIC, FILMATIC
#2 CINN. CENTERLESS, FILMATIC
Covel #91A Tool & Cutter Grinder
P&W Radius Grinders 12"x36" Surface
Hammond & Excello Carbide Grinders
Gardner #226 Disc Grinder
Black Diamond Drill Grinder
LANDIS #6 THREAD GRINDER
Ball & Jewel Plastic Grinders
NILES BEMENT POND 2500 lb. Steam Hammer
Davis #4 Keyseater, #2 Baker
Hi Speed Hammers all sizes
BOYE & EMMES 20"x30' G.H. LATHE
Monarch 10x20" Lathe Model EE
Hendey 12x30" G.H. Lathes
Ledge & Shipley 16"x78", 12 speed
S. Bend 9x31½", 10x48"
Sebastian 12"x4' G.H. Lathe
LeBlond Regal 15"x30, 10"x3½'
Sheldon TRB-56" Lathe
Hardinge, Rivett Precision Lathe
Cinn. & Schauer Speed Lathes
WARNER & SWASEY #3, 4 PRE-SELECTOR TURRET LATHES
Gisholt #4, 5 Univ. Turrets, Tooling
Morey #3 Turret Lathe
Acme #6W M.D. Foster 3B
Oster 601 Rapiduction Turret
Hardinge ESM 2nd operation
Brown & Sharpe #1, 2F Hand Screw
GORTON VERTICAL MILL 8D, 9J, POWER FEED & PLAIN
Cleveland #1 Vertical
Nichols Hand Mill Vert. Head
Van Norman Prod. Mill
Burke #4 Mills Pl. & Univ.
Cinn. 1-12, 2-18 Prod. Mills
Brown & Sharpe #12 Electric, #000 Production Millers
Van Norman #12, 26, 36 Duplex Head
Cinn. #3 Plain, #4 Vert. Dial Type
Cleveland #1 Vert. Miller
Kent Owens IV Prod. Mills, U.S. Mills
Reed Prentice #10D6 60Z, INJ. MOULDER
MARVEL AUTO. HACKSAW #6A
BLISS PRESS #58 OB Gap, 62, 62A, 162
Stokes Tablet Presses
V&O #102 Reducing Presses
Toledo 400 Ton Knuckle Joint Press
Diamond #31, 30 ton OBI Press
Bliss #4, 5½, Styles Presses
Federal #5 OBI Press, Bliss 21
V&O, Z&H, OBI 25, 35 ton
Ferracute DDG 56 105 ton Double action cam press
CANEDY OTTO 3'x9" COL. RADIAL
Oliver Heavy Die Filer, 510 Drill Pointer, Sellers 4G Drill Grinder
Onsrud Router #W240
Micromatic Hydrohoner H-1
Waterbury Farrel #30 Thread Roller & Dies 1943
Porter Cable G8 Belt Sander
Bakewell #1, Ultromat Tappers
Haskins 3C Tapper
Taylor Winfield 50 KVA Spot Welders
Thompson & Sciaky Seam & Spot Welders
Rafter Mod. 26 Tube Roller
Oliver 20" Woodworking Planer
Peerless #226, Eyeletting Mach.
Clark Hardness Tester
Gen. Flexible Elec. Screw Press
P & W Electrolimit Gage

AARON
VALUES IN MODERN TOOLS

NORTON ROLL GRINDER 50"x28' Centers. Motor Driven, actual swing 54". Bed divisible into two sections. *IMMEDIATE DELIVERY.*

NEW IN STOCK

Power, Foot & Gap Shears—30" to 96"
8' 10 Ga., 6' 10 Ga., 6' 14 Ga.
Spot & Arc Welders, 6x6" Racine Hacksaw
4, 5, 7, 10, 12, 18, & 30 ton OBI Power Presses
Ammco 7", Shape Rite 8", Shapers
H.S. Vertical Milling Heads
Drill Presses, Foot Presses, Air Hydraulics
Kalamazoo Metal Band Saws
No. 1½ Abrasive Wet Surface Grinder
20 ton Northern Hydraulic Presses
10Z & 20Z Injection Moulders
Famco 6C Arbor Presses—½ Price—Presses
Sheldon 12" B.G. Shaper

AUTOMATICS

Cone 4 spindle, Gridley
Brown & Sharpe #4, 6 Auto., #2 Hand Screw

BORING MILLS

#0 Giddings & Lewis arr. M.D. 3"
2½" Cleveland arr. M.D., 2½", 4" Binsee
Niles-Bement-Pond 4- duplex, 66" Niles
Bullard New Era 24", 42", King 42"

GRINDERS

Surface Grinders, 6x18, 8x24, Abrasive, G. & L.
P. & W. 14", B.B., Vert. Surface 19"x49"
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", MD. Cyl.
Heald No. 72A3 Gagematic
Norton 50"x28' M.D. Roll Grinder
Landis Type A 6x20" Hydraulic, M.D. Cyl.
No. 55, 60, 65 Heald Int., M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 10, 11, Cyl.: 1, 3 Univ.

LATHES

14"x6' Hendey Taper, Collets 16"x8'
9" LeBlond, P&W 1"x18" Automatic
36x30' Putnam M.D., 36x22', 42x16
32"x35' Wickes, M.D.
Wade, Hjorth, Hardinge, P & W Precision Bench

MILLING MACHINES

3B K. & T. Dbl. Overarm
Cleveland Vert. No. 1 M.D.; #1 Univ.
#2B K. & T. Univ.; No. 2, 2A B & S Univ.
No. 3S Cincinnati, S.P.D. rapid trav.
Nos 1½, 2, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 2, 3, 4 Cincinnati Vert., S.P.D.

HYDRAULIC EQUIPMENT

500 TON LAKE ERIE PRESS
Platen 35"x36", 36" stroke, 68" opening, 150 H.P., 220-440 V. Motor.
600 Ton Baldwin South. Platens 76"x59, Stroke 22", Opening 36".
500 Ton H.P.M. Double Action with 166 ton cushion. Platen 36"x36", Stroke 24". Opening 36".
1000 Ton French-Oil Bed 53x42", stroke 20" daylight 56".
Brand New 300 ton Watson-Stillman Hobbing Press & Pump.
375 Ton ELMES Double Action, with 60 ton cushion. Platen 84"x44", 12" Stroke, 42" Opening.

350 TON VERSON PRESS
40x40 Platen, 36" stroke, 72" opening, 100 H.P. 3 phase—60 cycle 440 volt.

400 & 500 TON SHAFT STRAIGHTENERS, Self Contained

All Hydraulic equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your hydraulic problems.

P. & W. No. 12, 1 & 2 spind. Profiler
B & S. No. 1, 3 Vert., Kempsmith No. 1, 2
Taylor-Fenn Spline Miller

RADIALS

Carlton 8' Arm 19" col. M.D., 3½' Mueller
4', 5', 6' American Triple Purpose
Walker-Turner ½" cap., Cinn. Blek. 6'

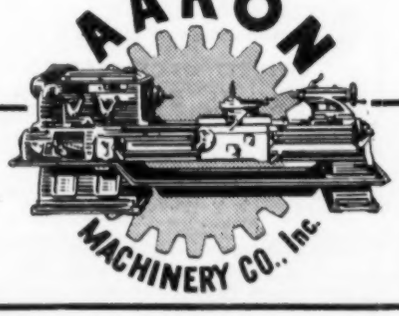
TURRET LATHES

Foster Nos. 4, 5, 6, 1B, 3B, M.D. Univ.
J. & L. 2"x24", 3"x36", W & S #4, 2A

MISCELLANEOUS

Buffalo 25UD Comb. Punch-Shear
Pexto 3' to 8' Shears & Brakes
Gorton 1A; 375-2 Tool & Cutter Grinders
Wiedman Turret Punch—Type R4P
6" Vertical Shaper, P & W
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
Deckel G1, G2, G1F Engraving machine
Leland-Gifford 1, 2 & 4 spindles, Model MS
Geo Ohl 6' 16 Gage M.D. Shear, 12' 10 Ga. Brake
Oster No. 316B 6" Pipe Threader, M.D.
Bliss 30" Gang Slitter, 19, 20, 21 OBI Presses
Double End Buffers, 1HP, 5HP
K.R.W., Lemco Hydr. Arbor Presses

WRITE FOR OUR FREE ILLUSTRATED CATALOG



AARON MACHINERY CO., Inc.

45 Crosby Street — New York 12, N. Y.
WOrth 4-8233 — Cable: AARMACH, N. Y.

MONA

SWISS JIG BORER

MODEL MP-6 B SERIAL #127
TABLE SIZE 40" x 60"

2 VERTICAL SPINDLES Horizontal Side Head
U. S. Standard Calibrations
Rotary table 31½" diameter, type PD-6,
Serial #444

1 type 1 A BORING BAR
1 type 2 A BORING BAR

Complete with tooling; 1 year old.
This machine is perfect.

1 Brandes High Speed PUNCH PRESS;
175-ton capacity.

1 Brandes High-Speed PUNCH PRESS;
375-ton capacity. 2 years old;
condition perfect.

Thompson Surface Grinders with 24"x96"
Magnetic Chuck, like new.

Save-Way "Spitfire" Internal Grinder
Serial No. 1-S-A, new, tremendous savings.

SPECIFICATIONS ON REQUEST

PRICE-THOMAS, INC.

1970 E. 59th ST., CLEVELAND 3, OHIO (EXpress 1280)

COLD ROLLED STEEL

FOR SALE BY
BANK OF CLEARWATER
Clearwater, Fla.

Lbs. per Length	Shape	No. Pieces	Description	Gauge	Size
20		624	Channel	14	3" x 3" x 3" x 96"
5½		240	"	14	1⅛" x 2" x 48"
9		626	"	14	1" x 2" x 96"
17½		742		11	1" x 6" x 1½" x 5'
29		650		11	1" x 6" x 1½" x 8'
8		250		14	1" x 1" x 2¼" x 1" x 1" x 8'
4		140		14	1" x 1" x 2¼" x 1" x 1" x 4'
1½		251		14	½" x 1" x 4'
7½		580	Channel	14	1⅛" x 2" x 1⅛" x 9'
14		240		15	1" x 6" x 1½" x 78"
7		90		14	½" x 2" x 1½" x 1½" x 1½" x 4'
11		736		15	2" x 1½" x 1½" x 8'
1		250		17	1" x 1" x 4'
		209	Seamless Steel Tubing	14	2" x 2" x 19'

We will sell *all* of above steel to any one purchaser at a liberal discount.
There is about 38 tons in all. However we will sell any one item.

BENNETT SPECIALS

36" Bullard Mill, Spiral Dr., 4 Jaw
4" bar Universal Table Type Mill, 60" spin. to table, 96" spin. to outer support, '42.
3½" & 4" Landis Floor Type Mills
3" bar Yoder, Table Type Hor. Mill, 30" spin. to tble., 72" spin. to outer support, 1942.
48"x20' centers N.B.P. Lathe, Grd. Hd.
42"x96" cen. Amer. Lathe, Grd. Hd., M.D.
48"x⅛" Roller Leveller, 11—4" rolls
36"x32" bed Niles Lathe, 2 carr., T.A.
16"/18½"x54" cc Springfield, TA, '44
7' Carlton 17" col. Radial, 1943
Nos. 5, 4, 3 & 2 W. & S. Turrets, Late
No. 4 Gisholt Univ. Turret Lathe, 1942
2⅝" Acme Gridley RA8 Automatic, 8 spin.
1⅝" Conematic, 8 spin. (4)
Model 65 New Britain-Gridley 6 Spin., work Rotating Type, New 1943
#9DT Potter Johnson Automatics (2)
#4H—12" Libby Slid. Bed Gap (5)
36"x36"x12' Cinci. Hypro Planer, 4 hds., Var. Voltage, 1943
24"x24"x16' Ingersoll Planer Type Miller, 4 hds., 20 H.P. AC, M.D.
48" N.B.P. Slotter, Grd., Late
15'x¾" Wicks, Bending Rolls, M.D.

BENNETT MACHINERY CO.
30 Church St., New York 7, N. Y.

No. 0G B & S High Speed Automatics, M.D.
No. 4 Cinn. High Power Vert. Mill, M.D.

MONA MEMBER

D. E. DONY MACHINERY CO.
47 Laurelton Road, Rochester 9, N.Y.

Bor. Mill, Hor. 3" G and L, MD.
Boring Mills, 24"-36"-42"-52"-72"-96"
Drills, Radial 3'-4'-5'-6' Cin.-Bick.
Lathe, Turret 3-A W and S, S.P.D.
Millers, Plain No. 3 K and T, No. 4 Cin.
Millers, Vertical No. 3 B and S and No. 4 Cin.
Shaper, 16"-20"-24"-36".
Shaper, 36" Morton Draw Cut.
Squaring Shear, Niagara 11'x10 gauge

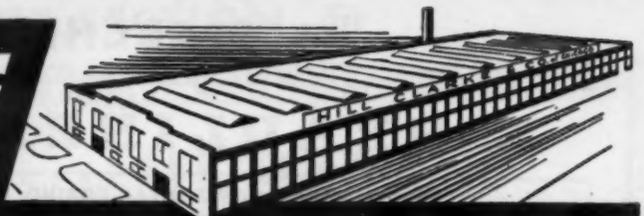
West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

MACHINERY FOR SALE

Potter & Johnston 5 DE Machine
3 spindle Gould & Eberhardt 36B Rougher
16" D. E. Whiton Gear Cutter motorized & rebuilt by the manufacturer.
Ledge & Shipley Duomatic Lathe.

SIER-BATH GEAR PUMP & CO., INC.
9252 Hudson Boulevard, North Bergen, N. J.

HILL-CLARKE MACHINERY COMPANY



ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. H. PRICE, Secretary

FOR YOUR PROTECTION ONLY HILL-CLARKE OFFERS YOU THIS 5 WAY GUARANTEE

1. A responsible organization — over 80 years experience.
2. Modern machines—no worn out equipment.
3. Every machine remanufactured or carefully inspected by experienced craftsmen.
4. You can see your machine tested under power.
5. Hill-Clarke's unconditional money-back guarantee.

● **FATHER AND SON TEAM. H. W. Mons, President, right, and E. R. Mons, Salesman, left, together offer for your service 59 years experience dealing in machine tools.**

AUTOMATICS

No. 2 Brown and Sharpe
1⅝" Greenlee, 6 Spdls. (1941)
No. 61 New Britain 6 Spdls. 1⅝" (1942)
No. 6 Brown & Sharpes

DRILLS

No. D8 Colburn No. 6 Morse Taper
No. 2LMS—26"—1 Spdl. Leland-Gifford
No. 2LMS—14"—3 Spdl. Leland-Gifford
No. 2LMS—26"—4 Spdl. Leland-Gifford
No. 2LMS—26"—6 Spdl. Leland-Gifford
No. 3B—24"—6 Spdl. Edlund (1942)
No. 2—8 Spdl. Leland-Gifford
No. 4BL Natco 36 Spdls.
7'-15" Col. American Full Universal
6'-17" Col. Fosdick Radial

GEAR MACHINES

No. 7125 Fellows (1943)
No. 712 Fellows Auto Indexing (1943)
No. 72 Fellows Gear Shaper
No. 18H Gould & Eberhardt
11" Gleason Bevel Gear Cutter
12" Gleason Bevel Gear Cutter
72" Cincinnati Gear Cutter

HOR. BOR. MILLS

No. 31 Lucas, 3" bar
Rockford, 3⅛" bar
No. 46-B Heald

GRINDERS

4"x12" Landis, Model H (1942)
4"x18" Landis Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x18" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x48" Norton Type C Plain (1943)
Norton Motor Driven Plain Grinders
6"x18" —— to —— 24"x240"
12"x36" Landis Type LCH Universal (1945)

No. 5—8"x24" Covel Hydr. Surf. (1941)
No. 34 Abrasive Surface (1943)
No. 22—12" Heald Rotary Surface
No. 25A—24" Heald Rotary Surface (1943)
#36-A Hanchett Rot. Surf.

72A-3 Heald Internal Grinder (1942)
72A-5 Heald Internal Grinder (1942)
74 Heald Internal Gdr. (1942)
No. 5 Bryant Internal Grinder (1942)
No. 16-16 Bryant Internal Gdr. (1942)
No. 16-38 Bryant Internal Grinder (1942)

LATHES

14"x6' Hendey Yoke Head
15"x5' Sebastian, Grd. Head
16"x5' Pratt & Whitney, Model B
16"x54" centers LeBlond (1941)
18"x6' American, Grd. Head
19"-38" gap x 10' LeBlond
36"x30' Lodge & Shipley
36"—48"x16' Lehman Hydrotrol (1945)
48"x20' centers Simmons (1942)
50"x17' centers LeBlond (1942)

LATHES (Production)

8"x15" Sundstrand, Model D (1943)
10"x22" Sundstrand, Model AA (1943)
12"x18" Lipe Carbo (1942)
20"x25" Fay Automatics (1942)

MILLING MACHINES

No. 4 Cincinnati Plain (1943)
No. 08 Cincinnati Vert. (1942)
No. 2 H Milwaukee Vertical
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
24" Cincinnati Production
No. 1-18 Cinn. Mfg. (1940)
No. 2—18" Sundstrand-Electromil (1942)
No. M-24 Milwaukee Simplex (1942)
38"x40"x10' Fitchburg Duplex Miller (1943)
No. 4-48 Cinn. Hyd. Tracer (1942)
No. 45-48 Cinn. Hyd. Plain Tracer (1942)
No. 56-90 Cinn. Hydromatic (1943)
No. 2 Hanson-Whitney Thread
4"x9" Hanson-Whitney Univ. Thrd. Miller
4½"x12" Pratt & Whitney, Model C
6"x36" Lees-Bradner—Model HT (1943)
6"x48" Pratt & Whitney Thrd. Miller
6"x80" Pratt & Whitney Thread
6"x132" Pratt & Whitney Thread Miller
6"x168" Pratt & Whitney Thread
10"x48" Hanson-Whitney Thread
4" Taylor & Fenn Spline, M.D.
24"x24"x12' Ingersoll Adj. Rail
36"x36"x16' Ingersoll Slab Miller
No. 10 Ingersoll 72"x6' Traveling Col. Face Millers (1942)
54"x54"x8' Davis & Thompson Open Side (1943)

MISCELLANEOUS

18" Dill Slotter
Model H-7 Micromatic Hydro Honer
Model H-2 Micromatic Hydro Honer
Model 200 Micromatic Hydro Honer
No. 22-C Racine Shear Cut Hack Saw
8-M Wells Band Saw
No. 20 Bliss O.B.I. Press
No. 2 V & O open back press
No. 0 Bakewell Tapper
Baush Radial Tapper (1942)

PLANERS

36"x36"x12' Cincinnati
36"x36"x18' Gray, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

TURRET LATHES

No. 2 B. & S. Screw Machine, Wire Feed
No. 3 Jones & Lamson Bar
No. 5 Warner & Swaseys (1942)
No. 5 Bardons & Olivers (1942)
No. 5 Midland, Bar Feed
No. 2-A Warner & Swasey
No. 1-H Libby, 6¼ Hole in Spindle (1937)
No. 1-H Libby, Extra Long Bed (1942)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle

VERT. BOR. MILLS

34" King
36" Rogers, side hd. (1942)
72" Niles Extra Heavy 84" Betts

FEATURE OF THE MONTH

6'-17" column Fosdick Economax Hydraulic Radial Drill, color-on-arm centralized controls. See it under power at our plant now.

ASK FOR OUR COMPLETE LIST

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**
651 WASHINGTON BOULEVARD, CHICAGO 6, ILL. • PHONE FRanklin 2-4761

HEADLINERS

EXTRA LARGE HORIZONTAL BORING MILL

#43 LUCAS Horizontal Boring, Drilling & Milling Machine, AC MD, 4½" diameter spindle, 20 feet from faceplate to outer support, 48" height over table, 72"x72" table, with auxiliary table. Excellent condition.

LATHES

12"x5' SEBASTIAN Model R Grd Hd., new 1947
14"x6' AMERICAN 12-speed Grd Hd, AC MIB, taper
16"x54" strs AMERICAN "Pacemaker", taper, chucks collets, (1943)
20"x8' LODGE & SHIPLEY Selec Grd Hd, AC MIB, taper
22"x10' ROCKFORD 3 SCD DBG bowl hd
24"x12' BOYE & EMMES, AC Turner Uni-Drive
24"x14' LODGE & SHIPLEY, Turner Drive, Taper
30"x16' LODGE & SHIPLEY, Lima Drive, taper

MILLERS

#1M CINCINNATI Rect. O/A Pl., AC MIB
#2 CINCINNATI H.P. Rect. O/A Plain, AC MIB, PRT, Timken
#2B MILWAUKEE Plain, AC MD, DOA
#2M CINCINNATI Plain, AC MIB, Timken, #50 spindle
#4 CINCINNATI H.P. Univ., Lima Drive, div hd, vert hd, slot attach
#4B BROWN & SHARPE Plain, AC MIB, DOA, #50 spindle
6"x84" PRATT & WHITNEY Thread

SHAPERS & PLANERS

14", 24", 28", 32" GOULD & EBERHARDT High Duty
28" AMERICAN H.D., AC MD
30"x30"x8' CINCINNATI, AC MD
36"x36"x16' GRAY, AC MD, 4 hds

DRILLS

#2 COLBURN Mfg.
#3 AVEY, AC MD, 12" OH
21" & 24" CINCINNATI-BICKFORD slid hd
24" CINCINNATI-BICKFORD "Super Service" (1943)

RADIAL DRILLS

4' MORRIS, MD
6' CINCINNATI-BICKFORD mtr on arm
7' DRESES, 17" col., AC MD thru gearbox

GRINDERS

8"x18" CINCINNATI Saddle Type Cyl., AC MD
#3 ABRASIVE Surface, AC MD

BORING MILLS

#3A UNIVERSAL Horz. 3" bar, SPD
#43 LUCAS Horiz., AC MD, 4½" bar, 20' betw faceplate & outer support

GEAR MACHINERY

#1 ADAMS Hobber, AC MD
#18H GOULD & EBERHARDT Hobber, AC MD
#34 BROWN & SHARPE Hobber, AC MD
#24-H GOULD & EBERHARDT Hobber, AC MD, new 1943
#61 FELLOWS Shapers

TURRET LATHES

#2B FOSTER Univ. Grd Hd, SPD
#4-W CINCINNATI ACME Univ., AC MD, thread chasing
#4 GISHOLT Univ., AC MIB, "Preselector", new 1942

MISCELLANEOUS

#4 WATERBURY-FARRELL Thread Roller, AC MD
2½" LANDIS Double Head Bolt Threader, AC MD
10" PRATT & WHITNEY Vert. Shaper
10'x16 ga. CHICAGO Steel Leaf Brake, AC MD
INGERSOLL-RAND XB2 Air Compressor, 888 cu. ft., AC MD
#402E BARRETT Oil Extractor

YOUR INQUIRIES SOLICITED

COX MACHINERY CO.,
P. O. Box 1953 CINCINNATI 1, OHIO
OFFICE AND WAREHOUSE: 311-313 Bakewell St. Covington, Kentucky
Three minutes from the Cincinnati hotel district.

REBUILT BY EXPERTS ONLY BOTWINIK MACHINE TOOLS Keep Production Up Costs Down

All Late Type Tools

GRINDERS

Brown & Sharpe No. 2 Universal—Ser: 4263—swings 14"—dist. betw. ctrs. 30"—complete with coolant — internal grinding atchmt — considerable tooling.

Jones & Lamson, Model TG, 6"x36" Automatic Thread Grinder—Ser. No. 110927 (1944 vintage—equal to new) considerable tooling.

Mattison 14"x24"x60" High Power Hydraulic Horizontal Precision Surface Grinder—complete with magnetic chuck.

LATHES

Reed Prentice 16"x8', model "B" 16-speed Geared Head Engine Lathe (1942 vintage) swings 18½", centers 54"—Timken bearing spindle—complete with taper atchmt, threading dial, two chucks, std equip.

Seneca Falls short cut Lathe, swings 14", centers 16".

3—Le Blonde Gun Boring Lathes.

TURRET LATHES

3—Bardons & Oliver No. 3 Univ.—swing 15¾", spindle hole 1⅞"—Two (2) 3 HP to 1015 RPM—one (1) 5 HP to 1525 RPM—with bar feed.

Cincinnati-Acme No. 6 Universal—swings 20¼"—spindle hole 3".

MISCELLANEOUS

Gleason 3" Straight Bevel Gear Generator (latest type)—Pneumatic chucking arrangement—cams—index plates—considerable other equipment.

Footburt model 3-12-6, 6-spindle Power Feed Ball bearing MD sensitive Gang Drill (1941 vintage) (Like new) overhand 12"—tbl. wkg. surf. 96"x24".

3—Potter & Johnson #6DRE Timken Bearing Auto. Chucking; Multi V-belt M.D.; swing 34"; turret feed 16"; hole thru spdle 2⅝"; spindle speeds 20, range 9-167 RPM; excellent condition, considerable tooling.

Only a partial listing of our huge stock. Write, wire or phone.

Botwinik Brothers
OF MASS., INC.
5 SHERMAN ST., WORCESTER 1, MASS

AUTOMATICS

#0G B & S, late type
1⅛" & 1⅝" 8 Spdl. Cone, late
9/16", 1" 1¼", 1⅝", 2", 2¼"
2⅝" Acme Gridleys, late
2¼" & 2⅝" Cone 6 Spdl., late
12" and 16" 8 Spdl. Bullard Multaumatics, late type with tooling

PRESSES

2800 ton Bliss Hydr., 3 col. type, 12" str., 50½" sht. ht., dia. bed 115"
60 ton Dbl. Crank, 5" stroke, 48x24 bed, late model Waterbury Farrel
90 ton Dbl. Crank, 8" stroke, 48x18 bed, late model Bliss
35 ton 4, 5, 6" stroke, latest type, w/all accessories, Bliss $850.00 ea.
70-85 ton 4" stroke 21 x 27 bed, 110 strokes per min., Bliss, latest type
90-125 ton 4½" or 5" stroke, 60, 80, 110 (optional) strokes per min., late type
Inclinable, New, 20 to 70 ton, immediate delivery

TURRET LATHES

#4 & #5 Warner & Swasey, late type, lots of tooling
#4FU Fastermatic, 4" cap., late type
#3H8 Libby Sliding Bed Gap, 8¼" cap., late type

PAUL'S MACHINERY COMPANY
MDNA MEMBER
6111 Vermont Avenue
Detroit 8, Michigan
TYLER 7-6300

No. 8-E Bliss Triple Crank Press, 225 ton, Bed 42" FB x 108" RL, Friction Clutch, Double BG, MD Ram Adjustment

BORING MILL, No. 31 Lucas Horizontal
BORING MILL, 48" Colburn Vertical, PRT, 2 Swivel Heads, Single Lever Control
GEAR HOBBERS, No. 12-H and 24-H G & E
GRINDERS, 18" & 26" Hammond DE Disc, MD
GRINDERS, No. 16 Blanchard, 30" Chuck
GRINDERS, No. 25-A Heald Surface, 26" diameter Chuck, M.D.
GRINDERS, No. 13 Brown & Sharpe Univ. & Tool, 1942 Machine, Excellent
MILL, No. 3 Cincinnati Plain, MIB
MILL, No. 4 Cincinnati Universal, Timken Bearing, Rectangular Overarm
PRESS, No. 3A Bliss Double Crank
PRESS, No. 1B Superspeed, 10 ton High Speed Double Roll Feeds, M.D.
SHAPER, 10" Pratt & Whitney Vertical
THREAD GRINDER, 6"x15" Jones & Lamson, 1943 Machine, Fine Condition
THREAD MILL, 6" x 48" Pratt & Whitney

HOWARTH MACHINERY CO.
505 E. 9 Mile Road, Detroit 20, Mich.
Phone JOrdan 4-6490

MILLERS FOR SALE

BRIGGS Type 2A 18" feed Hyd. Latest
BROWN & SHARPE #13 Plain Auto. Motor Drive
BROWN & SHARPE #2I Plain Auto. MD
CINCINNATI #3, #4 Plain rect. overarm MD
CINCINNATI 24" Duplex Timken MD
CINCINNATI #3, #4 Vertical MD
HALL Style D Planetary Latest
INGERSOLL 30x24x12' Planer Type MD
KEARNEY & TRECKER #4 Heavy Timken MD
LEBLOND #4 Plain Belted MD
SUNDSTRAND Model 3A Vertical Rotary Latest
SUNDSTRAND #3 Profile & Channel Latest
SUNDSTRAND Model 3A Duplex Timken Latest
VAN NORMAN #3 Duplex Universal MD

HARRISON MACHINERY EXCHANGE, INC.
South 4th St. Harrison, N. J.
10 minutes from New York City—5 minutes from Newark, N. J.
Tel.: HUMBOLDT 2-5750, 2-5775

ENGINEERED REBUILT MACHINE TOOLS

BUILT MACHINE TOOLS

ENGINEERED REBUILT

FOR HEAVY TOOLS.....SEE SIMMONS

BORING MILLS

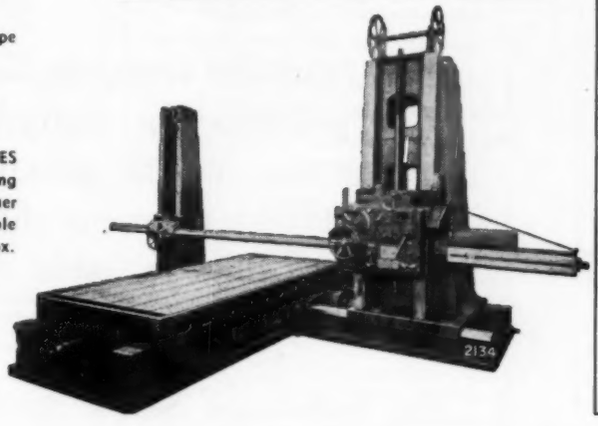
24"—36" and 42" New Era Bullard
36"-44" Niles Vertical Turret
42" & 52" King, 2-Heads
48" & 54" Colburn, 2-Heads
60" & 72" Niles, 2-Heads
61" Bullard Maxi Mill
84" Niles, 2-Heads
10' & 12' Niles, 2-Heads
10' Betts with side head
14' Niles, 2-heads
2½" Cleveland, Table Type
4" Lucas, Table Type
5" Niles, Table Type
10" Sellers, Floor Type

6" & 3½" Spindle JONES Late Type Boring, Drilling and Milling Machine. Planer table 7'6"x17' Max. Table to 6" Spindle 8'6", Approx. Weight 160,000#.

A SIMMONS SPECIAL

Probably the only lathe of its size available in the United States

14' x 34' Centers Niles Heavy 3-Way Engine Lathe. 153" swing over carriage. 50-H.P., 350/1050 Variable Speed 230 volt D.C. Motor. Power Rapid Traverse. Weight approximately 190,000#.



FOR IMMEDIATE SHIPMENT

36"x24' Niles "Timsaver" geared Head Engine Lathe
36-44" Niles Vertical Turret Lathe with side head
24" Bullard "NEW ERA" Spiral Drive Vertical Turret Lathe
26" Libby Turret Lathe, 7½" Hole, Thread Cutting
2½" Spl. Cleveland Horizontal Boring, Table 20"x42"
32" Cincinnati Shaper
18" and 24" NEW Simmons Shaper
16"x10' NEW Simmons Engine Lathe
No. 2 and 3 Brown-Sharpe Universal Millers
No. 1 NEW Simmons Plain Miller
6" Pratt-Whitney Vertical Shaper
#70 Heald Internal Grinder, 3-Motors
1—H.P. NEW U.S. Floor Grinders 12"x1½" Wheels
No. 2 NEW 1¼" Simmons B.G. Turret Lathes
#36-H Gould & Eberhardt Gear Hobber

Write today for Complete Current Stock List of Simmons *Engineered-Rebuilt* Machine Tools.

SIMMONS MACHINE TOOL CORPORATION

MAIN OFFICE AND PLANT 1759 N. BROADWAY ALBANY 1 N. Y. NEW YORK OFFICE 50 EAST 42ND STREET

ENGINEERED *Machine Tool* REBUILDING

PLANERS

48"x48"x12' Cincinnati Rapid Traverse, 4 heads
36"x36"x12' Woodward & Powell, 4 heads
32"x32"x10' Whitcomb, 2 heads
24"x24"x10' Whitcomb, 2 heads
Older Type machines, in excellent condition

HAZARD BROWNELL
350 Waterman St., Providence 6, R.I.
Dexter 8880

Roller Type Scalping Machine 22" Slab Capacity
#1A W&S Turret Lathes Bar Feeds
Libby 26" Turret Lathe, 4½" Hollow Spindle
#33 ExCello Ext. Thread Grinders
Norton Ext. Plain Grinder 24"x36"
Landis #3 Universal Cyl Grinder 16"x48"
Lees Bradner CT 36" Thread Millers
W.S. Bowling Contour Roll Grinder
Farnham Forming Roll 12'
Onsrud Router Model A-4-RR 84"
Moline 3 sp—Model 7D—Cylinder Borer
6 sp. Baird Chucker 15 HP AC Motor Drive

CONTINENTAL SALVAGE & MACHINERY CORPORATION
1836 EUCLID AVENUE, CLEVELAND 15, OHIO
MAIN 4402

SHEET METAL MACHINERY

NEW and USED — HAND and POWER. Apron Brakes, Press Brakes, Shears, Forming Rolls, Power Presses, Pittsburgh Lock Machines, Spinning Lathes, Spot Welders, etc.

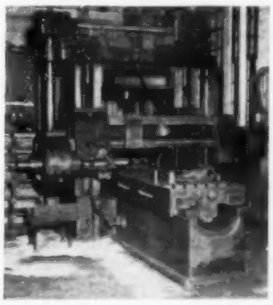
MDNA WDWDSB

B. D. BROOKS, INC
361 Atlantic Ave., Boston 10, Mass.

REYNOLDS

OF PROVIDENCE

OFFERS THIS — BECKER PLANER TYPE HORIZONTAL MILLER



Table—30" wide x 8' long. Width between Uprights 36". Height from Table to Center of Arbor Max. 22". 25 HP—220/3/60 Motor.

BARGAIN $1750.00
f.o.b. PROVIDENCE

REYNOLDS

MACHINERY COMPANY
305 Eddy Street
Providence 3, R. I.
Telephone JAckson 8900

NEW— SURPLUS

TUNGSTEN CARBIDE TIPPED SIDE MILLING CUTTERS

3" x ¼" x 1"	$ 8.13
3" x 5/16" x 1"	8.13
3" x ⅜" x 1"	8.13
3" x ½" x 1"	8.13
4" x 5/16" x 1"	12.50
4" x ⅜" x 1"	12.50
4" x ½" x 1"	12.50
4" x 9/16" x 1"	12.50
4" x ⅝" x 1"	12.50
4" x ¾" x 1"	12.50
5" x ½" x 1" or 1¼"	15.63
5" x 9/16" x 1" or 1¼"	15.63
5" x ⅝" x 1" or 1¼"	15.63
5" x ¾" x 1" or 1¼"	15.63
6" x ½" x 1" or 1¼"	18.75
6" x ⅝" x 1" or 1¼"	18.75
6" x ¾" x 1" or 1¼"	18.75
8" x ¾" x 1" or 1¼"	25.00
8" x 1" x 1" or 1¼"	25.00

VICTOR MACHINERY EXCHANGE, INC.
251 Centre St., New York 13, N. Y.
CAnal 6-5575

The SEARCHLIGHT SECTIONS

(Classified Advertising)

of McGraw-Hill Publications

can help you by bringing business needs or "opportunities" to the attention of other men associated in executive, management, sales and responsible technical, engineering and operating capacities with the industries served by:

American Machinist
Aviation Week
Business Week
Bus Transportation
Chemical Engineering
Coal Age
Construction Methods
Electrical Construction & Maintenance
Electrical Merchandising
Electrical Wholesaling
Electrical World
Electronics
Engineering and Mining Journal
E. & M. J. Markets
Engineering News-Record
Factory Management and Maintenance
Food Industries
Operating Engineer
Power
Product Engineering
Textile World
Welding Engineer

"*SEARCHLIGHT*" Can Help You!

HUNDREDS of miscellaneous business problems that confront you from time to time, can be quickly and easily solved through the use of the Searchlight Section of this or other McGraw-Hill publications.

The Searchlight Section is the classified advertising appearing in each of these papers. You can use it at small cost, to announce all kinds of business wants of interest to other men in the fields served by these publications. It is the regular meeting place of the man with a miscellaneous business need and the men who can fill that need.

When you want additional employees, want to buy or sell surplus used or new equipment, want additional products to manufacture, seek additional capital, or have other miscellaneous business wants—advertise them in the Searchlight Section for quick, profitable results!

Classified Advertising Division

McGraw-Hill Publishing Co., Inc.

330 West 42nd Street, New York 18, N. Y.

SACRIFICE
GRINDER

HEALD: WITH AUTOMATIC SIZING. CAN GRIND HOLES UP TO 5½" DIAMETER, AND UP TO 10½" LONG. EXCELLENT CONDITION. SACRIFICE.

LATHE

GEARED HEAD: 21" SWING, 38" BETWEEN CENTERS. QUICK CHANGE, AC MOTOR DRIVE. PRODUCTION, NO THREAD CUTTING. EXCELLENT CONDITION. $575. BOTH OUT OF TOWN.

H. GOLDBERG 45 Astor Place N. Y. 3, N. Y.

AIR COMPRESSORS

1 5000 cubic foot Ingersoll-Rand PRE-2 Air Compresser direct driven by 640 KW. General Electric Synchronous Motor 150 RPM 2200 Volts 60 cycle. Cylinder sizes 23" and 37" x 27" stroke.
1—600 cubic foot Ingersoll-Rand Imperial Type 10 XB Short belt drive by 100 H.P. Westinghouse Type CW 3/60/440 volt Motor.

1—#4 REED-PRENTICE VERTICAL MILLING AND DIE SINKING MACHINE, complete with motors and extras $9500.00. Cost new $19500.00. Like new. Serial 19878.
1—400 Ton Bliss Coining Press, MD
1—#2 Ajax Forging Rolls
1—Cleveland 250 ton shear capacity 7"x1¾" plate 4" dia. round bars.
2—48"x48"x10' Planers, MD 3 heads—Cincinnati and Cleveland Openside
1—4000# Erie Steam Drop Hammer 1942—air operated.
Board Drop Hammers—2000# Erie; 2000# Chambersburg 1000# Billings & Spencer
1—24" New Era Bullard Vertical Turret Lathe.

H. J. KOONTZ, Massillon, Ohio. Phone 8180

STOCK TOOLS — *Prompt Shipment*

BORING MILL, Hor. #0 G & L, 3" bar.
BORING MILL, Vert. 14' Niles 2 Hds., M.D.
BORING MILL, 42" King, 2 Hds., M.D.
BORING MILL, 72" N-B-P, 2 hds., M.D.
BROACH, XA Oilgear, Hor., 60" Str.
DRILL, Radial 5' Cincinnati-Bickford.
DRILL, Radial 6' American, Mtr. on Arm.
GEAR HOBBERS, 12-H Gould & Eberhardt.
GRINDER, Broach, "E" Thompson, 6x48" Hyd.
GRINDER, Int., No. 72-A-5 Heald, Hydraulic.
GRINDERS, Surf. Nos. 3 & 5 Abrasives.
GRINDER, Surf. Rotary No. 25 Heald.
HAMMER, Pneumatic, Nos. 4-B & 6-B Nazel.
HAMMER, Steam Drop, 2000# Chambersburg.
HAMMER, St. Forging, 6000# Chambersburg.
LATHE, 9"x5' Hardinge, Prec., M.D.
LATHE, 14"x6' Hendey, Tie-Bar, T.A., M.D.
LATHE, 14"x6' L & S, 12-Speed Grd. Hd.
LATHE, 22"x16' L & S, Q.C.G., T.A.
LATHE, Turret, No. 3-A W & S, 4¼" h.s.
MILLERS, Pl. No. 4, & 5 Cincinnati.
MILLER, Plain No. 4B K & T, Vert. Att.
MILLER, Thread, No. 40 Lees-Bradner.
MILLER, Duplex, 24" Cincinnati.
MILLER, Univ. No. 4 Cincinnati
PLANER, 30"x30"x8' Liberty, M.D.
PRESS, 9.S., 250 Ton Chambersburg, Hyd.
SHAPERS, 24" and 32", M.D.
SHAPER PLANERS, Openside, 26" Farquhar.
SHEARS, 12' x 18 ga., 11'x1½".
SHEAR, Sq. No. 372 Stell, 72"x⅛".
UPSETTER, 4" National, M.D.

LANG MACHINERY COMPANY
28th St. & A.V.R.R. Pittsburgh, Pa.

FOR SALE

24-H G & E Hobber, Motor Driven.
Now #4 Davis Keyseater, cutters, M.D.
6" Atlas Miller

TILLERY GEAR WORKS
West Point Georgia

FOR SALE — *Ready for Use*

Barnesdrill—#307 Single Spindle Hydraulic Honing Machine
Planer—36"x36"x12' Niles-Bement-Pond

THE VIMALERT COMPANY, LTD.
Jersey City 5, N. J. Delaware 3-6400

"WALSH" PUNCH PRESSES

Size	Stroke	Delivery
6 Ton	1¼" or1½"	10 days
12 Ton	1½" or 2"	Immediate
18 Ton	2" x or 2½"	Immediate
20 Ton	2½" or 3"	Immediate
24 Ton	2" or 2½"	Immediate
28 Ton	2½" or 3"	Immediate
38 Ton	3", 3½" or 4"	Immediate
55 Ton	3" or 3½"	Immediate
65 Ton	4" or 4½"	Immediate

All Presses Complete with Drive, Motor, Counting and Safety Devices. Roll Feeds For All Presses. Two Weeks Delivery. Time Payments Arranged. Exclusive Distributors.

SCHULTZ & ANDERSON CO.
115 Edison Place, Newark, New Jersey
Tel. MArket 2-4318

FOR SALE

NEW 36" Raised-In-Sand to swing 48" 38' bed, 31' between centers, Latest model *HYDRATROL* Lathe, Taper Attachment, Pan and Pump, Power Rapid Traverse, 32" Chuck. Price on Request.

REBUILT 22"/24½" Lehmann Geared Head Lathe, 11' bed, 6' between centers, Taper Attachment, Pan and Pump, 21" Chuck, 7½ H.P., 220/440 motor. Price $6200.00 F.O.B. Cars.

LEHMANN MACHINE COMPANY
3560 Chouteau Ave., St. Louis 3, Mo.

WANTED

WANTED

Several PRATT & WHITNEY 30" or 40" Single Spindle. Profilers (Vertical Millers)
Several #4 or 5 KEARNEY & TRECKER Vertical Millers (late type)

W-7219, AMERICAN MACHINIST
330 W. 42nd ST., NEW YORK 18, N. Y.

WANTED

1—20 to 25' Boring Mill.
1—8' Vertical—11' Horizontal Planer Type Mill.
1—8' Radial Drill.
1—50 ton 75' span Crane.

W-7283, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

PRACTICALLY NEW
2—FEDERAL SEAM WELDERS

200 KVA—60 CYCLE—440 PRIMARY VOLTAGE

(1) Straight in feed, 45"x3.5" Throat
(1) Cross through feed, 45"x3.5" Throat Depth

AIR OPERATED PRESSURE TO ROLLS

Complete with GE Thyratron Seam Welding Controls. Price.....$1,500.00 ea.

WINSTON MACHINERY CO., INC.
517 South Delaware Street
INDIANAPOLIS 4, INDIANA

HEAVY EQUIPMENT FOR SALE

AJAX 1½", 3½" Upsetter and Forging MD
BIRDSBORO 325 Ton Vertical Press Hydraulic New 1942
BULLARD 16 6-spindle Multaumatic New 1943
CLEARING 50 Ton Hyd. Press New 1940
CRANES from 5 to 30 ton cap. 230 volts DC
DILL 20-24" Vertical Slotter MD
LAKE ERIE 500 Ton Vertical Press Hyd. New 1944
LEBLOND #2 Rifling & Reaming Machines
NILES 600 Ton Horiz. wheel press MD
NILES 100" Vertical Boring Mill 2 swivel heads, MD
NIAGARA 1000, 1200 KVA Transformers
QUICKWORK ¾", 1" cap. rotary shear MD

HARRISON MACHINERY EXCHANGE, INC.
South 4th St. Harrison, N. J.
10 minutes from New York City—5 minutes from Newark, N. J.
Tel.: HUMBOLDT 2-5750, 2-5775

(Continued from page 240)

POSITIONS WANTED

MACHINE SHOP Supt. Background. 20 years experience—medium to medium heavy machinery. Charge of mfg. and assembly, also labor relations. Good record. Reliable. Efficient. Desires position with small or medium size company. PW-6994, American Machinist.

DO YOU Need Steel? Former mill representative familiar with sources of steel supply and fabricated products, wishes position with manufacturer. Can aid in procuring materials, and sales. Salary arrangement. PW-7010, American Machinist.

MECHANICAL ENGINEER (22). Graduate N.Y.U. Veteran, single, go anywhere. PW-7192, American Machinist.

SELLING OPPORTUNITY WANTED

MANUFACTURERS AGENT with 10 years experience and well established sales organization wishes additional cutting lines particularly tungsten carbide tools, for Northern New Jersey and metropolitan New York territory. RA-7297, American Machinist.

PATENT ATTORNEY

Patent Practice

before U.S. Patent Office. Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine and Rommel, Registered Patent Attorneys. Suite 453, 815-15th Street, N. W. Washington 5, D. C.

FOR SALE

Ecco Induction Brazing and Hardening Machine. Type SMWGS16-20KVA. No reasonable offer refused.

R. E. WORDEN
DICTAPHONE CORPORATION
375 Howard Ave., Bridgeport, Conn.

FOR SALE

Attention to user—the following Equipment can be seen in operation—

1—Monarch Heavy Duty Gear Head Lathe 22"x48"—4 years old
1—3 Spindle Gould & Eberhardt 36 BM Bevel Gear Roughing Machine—6 years old
1—#16 Whiton Automatic Spur Bevel and Clutch Gear Cutting Machine — Motorized thoroughly rebuilt by manufacturer in 1945
2—Lodge & Shipley 3-A Duomatic Lathes—1-5 years old—1-10 years old
2—5DE Potter & Johnston Chucking Machines —10 years old
1—Double Spindle Heald Borematic—4 yrs. old
1—National Welding Cutting Off Machine

F.S.-7308, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

ALL LATE TYPE

AUTOMATIC—Model B, 1-1/16" Cleveland
BROACH—#3½L Lapoint Variable Speed Hyd.
GRINDER—10"x24" Landis Univ. Cylindrical
GRINDER—#372-53 Besley Horizontal Disc
GRINDER—#72 Hanchett Rotary Automatic
PRESS—#620 Bliss Hi-Production, never used
TURRET LATHE—#4 Warner & Swasey, Preselector

ALEXANDER & FIDEN MACHINERY CO., INC.
10 Austin Street Buffalo 7, N. Y.

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED
MONA

JOSEPH **HYMAN** & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

HYDRAULIC TUBE BENDING MACHINE.

Brand new R-48 Williams-White Machine with 3 HP motor, capacity 1½" dia. With 5 HP motor capacity 2" dia. Dies for bending 1" dia. In original crate.

GMC 1942 6x4 2½-5 ton Army Truck 12 ft. body including bows and tarpaulin. Excellent condition, low mileage. Excellent tires, priced to sell.

Both located Detroit Area. U. S. STEEL FURNITURE MFG. CORP., 190 Lexington Avenue, New York 16, N. Y.

Company with established agents abroad interested in additional export business. Distribution for manufacturers on exclusive, commission basis. *Reply stating particulars.*

R. A. 7200, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

Improved Head Design with Finger Tip Control

makes for easier operation

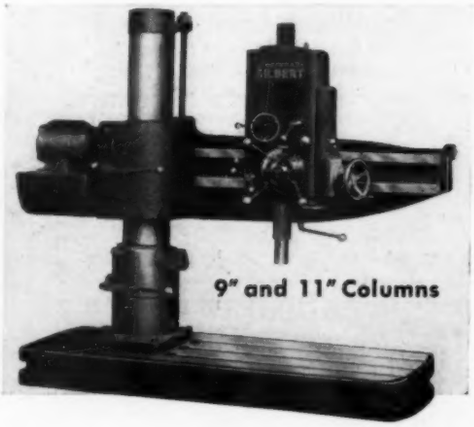
GILBERT MULTI-DUTY RADIALS

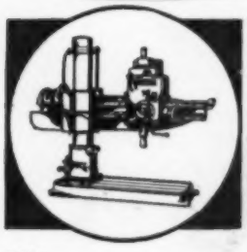
TWO FINGERS WILL SHIFT ANY LEVER

- *Speed Change Levers* control 12 speeds and direct reading plate simplifies speed selection.
- *Feed Change Levers* provide 6 feed changes, accurately by means of direct reading plate.
- *Speed and Feed Indicator* simplifies choice of proper speeds and feeds.
- *Head Clamp Lever* quickly binds head to arm.
- *Levers for Engaging Spindle Power Feed,* a forward pull on any of the turnstile levers engages friction clutch.
- *Spindle Friction Clutch Lever* used to reverse spindle on *tapping operations.*
- *Feed Handwheel* provides fine hand feed to spindle.
- *Head Traverse Handwheel* for hand traversing head along arm.
- *Feed Clutch Lever* for engaging spindle feed knockout *clutch.*

● Every improvement in the design of this new head was made to simplify operation of the machine — to save operator's time — to help him get greater production with less effort. All of which adds up to lower costs — on your radial drill output.

Bulletin available

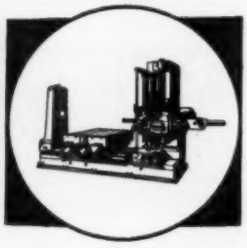




THE CINCINNATI GILBERT MACHINE TOOL CO.

3360 BEEKMAN ST. • CINCINNATI 23, OHIO

RADIAL DRILLS . . . HORIZONTAL BORING MILLS



INDEX OF PRODUCTS ADVERTISED IN THIS ISSUE

Abrasives 18-19, 24-25, 40-41, 68, 184, 194, 203

Accessories & Attachments (Machine Tool).....173, 210, 216, 217, 220, 232

Arbors & Mandrels 224, 232

Bearings .....4th Cover, 16, 162, 196, 219

Bending Machines 160, 229

Boring, Drilling & Milling Machines (Horizontal) 50

Broaching Machines 155

Brushes 176

Castings 55

Centers 231

Chucks 187, 216, 232, 234

Collets 49

Coolant Systems, Filters & Supplies....238

Cut-Off Machines; Sawing Machines.36-37, 151, 168, 173, 202, 229

Die Making Machines.....60

Dressers, Grinding Wheel.....237

Drilling Machines....52, 64, 69, 133, 136, 161, 193, 202, 209, 218, 228, 237, 254, 260

Electrical Parts & Equipment....38-39, 57, 177, 199

Fabricating Methods & Services.....191

Fasteners.....181, 197, 202, 205, 206, 234

Gages & Instruments.....34, 46, 164, 172, 218, 228

Gear Cutting Machines.....3, 6-7, 213, 236

Gears, Speed Reducers, Motor Reducers 53, 169, 235, 236, 237

Gear Testers 3

Grinders—Cutter & Tool..28-29, 180, 200, 217, 226

Grinding Machines—Production .....2nd Cover, 5, 12-13, 28-29, 30-31, 32, 33-34, 157, 161, 192, 198, 222, 228

Heads: Drilling, Grinding & Tapping..45, 48, 216, 226, 232

Heat Treating Equipment & Supplies 170, 222

Honing Machines 258

Hydraulic & Pneumatic Parts & Equipment 189, 223, 239

Jig Borers 183, 227, 228

Lathes, Automatic 35, 54, 61, 143, 190

Lathes, Engine.....3rd Cover, 20-21, 149, 153, 167, 222, 233

Lathes, Turret 54, 61

Lubricants, Cutting Fluids, Quenching Oils, Rust Preventives....43, 44, 63, 74, 182, 185, 221, 224, 225, 228

Materials, Cutting & Forming..14-15, 168, 179, 201, 204

Materials of Manufacture...138, 147, 165, 186, 219, 238

Mechanical Parts & Equipment.....224

Millers, Die Sinkers, Profilers.....4-8-9, 209, 210, 228, 234

Planers 56, 211

Power Transmission 195

Presses, Forging & Forming Equipment & Supplies 17, 36-37, 59, 62, 67, 70, 159, 160, 166, 168, 170, 174-175, 198, 207, 208, 215, 218, 220

Riveting Machines 218

Safety Equipment 178

Screw Machines; Chucking Machines 45, 51, 140, 218

Shapers, Slotters, Keyseaters..76, 202, 212

Shop Furniture 66

Special Machine Tools.....216, 232

Steel Blue 238

Swaging Machines 224

Tapping Machines 133, 193, 202, 209

Textiles 256

Threading Machines 10-11, 145, 198

Tooling Set-Up Equipment.....58, 216

Tools, Cutting 22-23, 26-27, 42, 45, 65, 134, 158, 163, 171, 172, 188, 201, 214, 216, 224, 226, 232

Tools, Hand 188

Transportation 214

Welding & Cutting, Brazing & Soldering Equipment & Supplies.....166, 191

"Pays Off" In Extra Days of Wear

REEVES ARMY TWILL

New Uniform Designs by Helen Cookman—Pat. App. for.

THERE'S A PAYDAY every day in uniforms made of Reeves Army Twill. This high quality fabric means real economy through extra days of wear at work... through repeated washings at home or at the laundry.

Reeves Army Twill has a high tensile strength and comes in a wide range of vat-dyed colors fast to sun, water and perspiration. And being Sanforized, residual shrinkage is less than 1%. It tailors beautifully for extra comfort and added good looks—two important assets for employee morale and customer good will.

Remember—over 100 million yards of this same fabric helped equip America's fighting men—exceeded Government specifications under the toughest conditions.

"FROM COTTON TO CUTTER"

THE REEVES FABRIC GROUP INCLUDES: Reeves Army Twill · Reeveking Gabardine · Glengarrie Poplin · Marine Herringbone · Byrd Cloth · Warrior Twill · Mountain Cloth · Pima King Broadcloth · Chesnee Gabardine · Reevecord · Parklyn Pique · Reeveweave

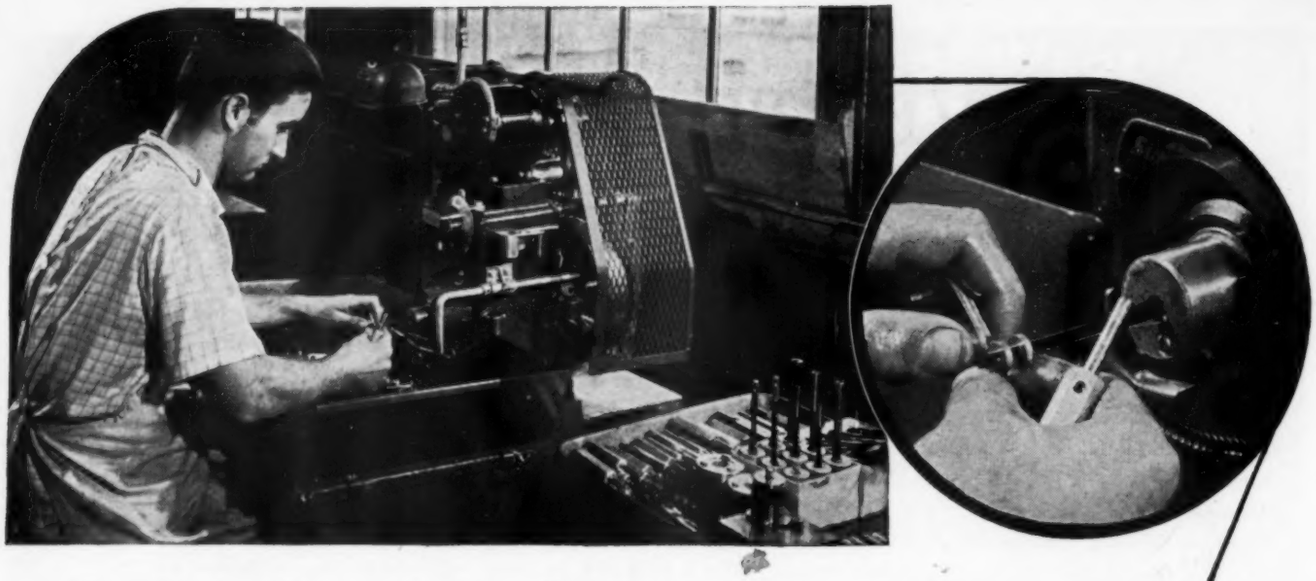
MADE OF FINE COTTONS

REEVES BROTHERS, INC. 54 WORTH STREET, NEW YORK 13, N. Y.

REPRESENTATIVES IN: *Akron · Atlanta · Boston · Chicago · Dallas · Los Angeles · Philadelphia · Portland, Oregon · St. Louis · Montreal · Toronto*

ADVERTISERS INDEX

	Page
Abbott Ball Co.	224
Abrasive Machine Tool Co.	200
Allegheny Ludlum Steel Corp.	204
Allied Research Products, Inc.	230
Allis-Chalmers Mfg. Co.	57
Almond Mfg. Co., T. R.	216
Aluminum Co. of America	55
American Broach & Machine Co.	62
American Optical Co.	178
American Screw Co.	181
American Steel Foundries, King Machine Tool Division	149
American Tool Works Co.	20, 21
Ames Co., B. C.	164
Armco Steel Corp.	138
Armstrong Brothers Tool Co.	58
Auto Engine Works, Inc.	237
Baldwin Southwark Div., Baldwin Locomotive Works	211
Barber Colman Co.	42
Baumbach Manufacturing Co., E. A.	220
Beatty Machine & Mfg. Co.	160
Behr-Manning Corp.	184
Bemis & Call Co., Inc.	220
Bethlehem Steel Co.	179
Birdsboro Steel Foundry & Mach. Co.	159
Blanchard Machine Co.	32
Bliss Co., E. W.	17
Bodine Corp.	193
Boston Woven Hose & Rubber Co.	195
Boyar Schultz Corp.	198
Bridgeport Machines Inc.	260
Brown & Sharpe Mfg. Co.	28, 29
Bryant Chucking Grinder Co.	33, 34
Bryant Machinery & Engineering Co.	47
Buffalo Bolt Co.	205
Bullard Co.	52
Bunting Brass & Bronze Co.	219
Camcar Products Co.	181
Carboloy Co., Inc.	237
Carborundum Co.	24, 25
Carlton Machine Tool Co.	228
Carpenter Steel Co.	14, 15
Carroll & Jamieson Machine Tool Co.	222
Central Screw Co.	181
Century Electric Co.	199
Cimcool Division, Cincinnati Milling Machine Co.	63
Cincinnati Bickford Tool Co.	69
Cincinnati Gear Co.	236
Cincinnati Gilbert Machine Tool Co.	254
Cincinnati Grinders Incorporated	5
Cincinnati Milling Machine Co.	4
Cincinnati Planer Co.	56
Cincinnati Shaper Co.	76
Clearing Machine Corp.	207
Cleveland Crane & Engineering Co.	151
Cleveland Punch & Shear Works Co.	67
Colonial Broach Co.	155
Columbia Machinery & Engineering Corp.	229
Columbus Die Tool and Machine Co.	232
Cone Automatic Machine Co.	51
Consolidated Machine Tool Corp.	49
Continental Screw Co.	181
Corbin Screw Div., American Hdwe. Corp.	181
Cosa Corporation	227
Cross Co.	133
Cullen-Friestedt Co.	166
Danly Machine Specialties, Inc.	70
Davis & Thompson Co.	230
Davis Keyseater Co.	202
Dayton Rogers Mfg. Co.	238
Defiance Machine Works, Inc.	209
Denfis Chemical Laboratories, Inc.	170
Detroit Reamer & Tool Co.	163
Dickerman Mfg. Co., H. E.	167
Dumore Co.	161
Earle Gear & Machine Co.	235
Eastern Machine Screw Corp.	216
Elco Tool & Screw Corp.	181
Erickson Tools Division	232
Erie Foundry Co.	215
Errington Mechanical Laboratory	226
Ettco Tool Co.	232
Evans Reamer & Machine Co.	220
Fellows Gear Shaper Co.	6, 7
Fenn Manufacturing Co.	224
Firth-Sterling Steel & Carbide Corp.	201
Foote-Burt Co.	136
Fosdick Machine Tool Co.	64
Gallmeyer & Livingston Co.	228
Ganschow Gear Co.	236
Gardner Machine Co.	157
Gear Grinding Machine Co.	213
Gear Specialties Mfrs.	53
Gisholt Machine Co.	54
Gleason Works	3
Gorham Tool Co.	231
Gorton Machine Co., George	217
Goss & de Leeuw Machine Co.	218
Grant Gear Works	235
Grant Mfg. & Machine Co.	218
Gray Co., G. A.	50
Gray-Mills Co.	238
Gulf Oil Corp.	185
Hardinge Brothers, Inc.	233
Harper Co., H. M.	181
Hartford Special Machinery Co.	216, 236
Heald Machine Co.	2nd Cover
Hendey Machine Co.	212
Hones, Inc., Charles A.	222
Houghton & Co., E. F.	221
Hoyland Steel Co.	168
Hyatt Bearings Div., General Motors Corp.	196
Hypro Tool Co.	158
Ingersoll-Rand Co.	239
Johnson Bronze Co.	162
Jones & Lamson Machine Co.	48, 145
Jones & Laughlin Steel Corp.	147
Kaufman Mfg. Co.	202
King Machine Tool	149
Knight Machinery Co., W. B.	210
L & J Press Corporation	170
Lake Erie Engineering Corp.	174-175
Laminated Shim Co., Inc.	234
Lamson & Sessions Co.	181
Landis Machine Co.	10, 11
Landis Tool Co.	12, 13
Langelier Mfg. Co.	218
LeBlond Machine Tool Co., R. K.	3rd Cover
Leland-Gifford Co.	202
Link Belt Co.	16
Linley Brothers Co.	228
Littell Machine Co., F. J.	220
Lodge & Shipley Co.	143
Logansport Machine Co., Inc.	223



The National Cash Register Company Uses SUNNEN HONING to Remove Burrs and Heat-Treat Distortion *Quickly* and at LOW COST

Some of the parts which are Sunnen Honed at The National Cash Register Company, Dayton, Ohio

Sunnen Honing is used by The National Cash Register Company to produce accurate internal diameters and smooth surfaces that contribute to the long trouble-free service of its products.

These Precision Honing Machines are used at National Cash Register on a wide variety of parts with holes ranging from ¼" to 1¾" in diameter. Tolerances for straightness and roundness as low as .0004" are easily held—production rates are high—and rejects are almost eliminated.

Sunnen Precision Honing Machines are a profitable investment wherever smooth accurate diameters must be produced:

- **Honing range from .120" to 2.625" in diameter —Including blind holes and bores with keyways.**
- **Hones all metals, ceramics, glass, steel, cast iron, bronze, brass and aluminum.**
- **Holes are accurate to .0001" — Sunnen honing corrects out-of-roundness, distortion, bell-mouth and taper.**
- **Machine produces any surface finish required — no high spots, chatter marks.**
- **Fast set-up; quick change-over of sizes makes Sunnen honing profitable even on short runs.**

Write for bulletin or, on request, a Sunnen engineer will be glad to show you the advantages of Sunnen Honing in your plant.

SUNNEN PRODUCTS COMPANY

TRADE MARK REG. U. S. PAT. OFF. • MARCA REGISTRADA

7935 Manchester Ave., St. Louis 17, Missouri • *Canadian Factory: Chatham, Ontario*

378

ADVERTISERS INDEX

	Page
Lovejoy Tool Co., Inc.	171
Luers, J. Milton	216
M & N Machine Tool Works	218
Mahon Co., R. C.	191
Meisel Press Mfg. Co.	236
Milford Rivet & Machine Co.	181
Modern Tool Works Div. of Consolidated Machine Tool Corp.	49
Moline Tool Co.	237
Monarch Machine Tool Co.	153
Moore Special Tool Co.	183
Morse Twist Drill & Machine Co.	22, 23
National Acme Co.	45
National Lock Co.	181
National Machinery Co.	208
National Machine Tool Co.	226
National Screw & Mfg. Co.	181
National Twist Drill & Tool Co.	27
Newark Gear Cutting Machine Co.	236
New Britain-Gridley Machine Div., New Britain Machine Co.	140
New England Screw Co.	181
Niagara Machine & Tool Works	36, 37
Nicholson File Co.	188
Nicholson & Co., W. H.	224
Norton Company	18, 19, 30, 31, 68
Oliver Instrument Co.	226
Osborn Manufacturing Company	176
Parker-Kalon Corp.	181, 206
Parker Rust Proof Company	182
Pawtucket Screw Co.	181
Peninsular Grinding Wheel Co.	40, 41
Perkins Machine & Gear Co.	169
Pheoll Manufacturing Co.	181
Phillips Screw Manufacturers	181
Pittsburgh Gear Co.	235
Potter-Johnston Co.	61
Pratt & Whitney Div., Niles-Bement-Pond Co.	60
Production Machine Co.	222
Railway Express Agency Div. Air Exp.	214
Reading Screw Co.	181
Reed Rolled Thread Die Co.	198
Reeves Brothers, Inc.	256
Rivett Lathe & Grinder, Inc.	180
Robbins Engineering Co.	187
Robertson Mfg. Co.	194
Rockford Screw Products Co.	181
Russell Burdsall & Ward Bolt & Nut Co.	181
Sales Service Machine Tool Co.	166
Scherr Co., Inc., George	172
Scovill Manufacturing Co.	181
Seaboard Screw Corp.	181
Seneca Falls Machine Co.	190
Severance Tool Industries, Inc.	224
Shakeproof, Inc.	181
Shore Instrument & Mfg. Co., Inc.	228
Southington Hardware Mfg. Co.	181
Springfield Machine Tool Co.	47
Square D Co.	177
Standard Oil Co. of California	225
Standard Oil Co. (Indiana)	43, 44
Standard Pressed Steel Co.	66, 222
Staples Tool Co.	172
Starrett Co., L. S.	134
Steel Company of Canada, Ltd.	181
Steelweld Machry. Div., Cleveland Crane & Engineering Co.	151
Sterling Bolt Co.	181
Sterling Grinding Wheel Div.	203
Strong Carlisle & Hammond Co.	202
Stronghold Screw Products, Inc.	181
Stuart Oil Co., Ltd., D. A.	224
Sunnen Products Co.	258
Tannewitz Works	202
Texas Co.	74
Thompson Grinder Co.	192
Timken Roller Bearing Co.	4th Cover
Union Twist Drill Co.	65
United States Machine Tool Co.	234
United States Steel Supply Co.	238
V. & O. Press Co.	220
Van Keuren Co.	46
Van Norman Co.	8, 9
Vickers, Inc.	189
Vulcan Tool Corp.	59
Waldes Koh-I-Noor, Inc.	197
Wales-Beech Corp.	181
Walker-Turner Co., Inc.	173
Walker Co., Inc., O. S.	234
Waltham Machine Works	216
Warner & Swasey Co.	35
Weldon Tool Co.	214
Westinghouse Electric Corp.	38, 39
Wheelock Lovejoy & Co., Inc.	165
White & Bagley Co.	228
Wilson Mechanical Instrument Co.	218
Winter Brothers Co.	26
Wolverine Bolt Co.	181
Wysong & Miles	168
Youngstown Sheet & Tube Co.	186

SEARCHLIGHT SECTION

(Classified Advertising)

	Page
EMPLOYMENT	
Positions Vacant	240
Selling Opportunities Offered	240
Positions Wanted	253
Selling Opportunities Wanted	253
Employment Services	240
SPECIAL SERVICES	
Contract Work	240
Dayton Rogers Mfg. Co.	240
General Pattern Works	240
Kamis Engineering Co.	240
Phoenix Screw Machine Co.	240
Premier Mill Corp.	240
Slocomb Corp., F. F.	240
EQUIPMENT	
(Used or Surplus New) For Sale	241-253
WANTED	
Equipment	253

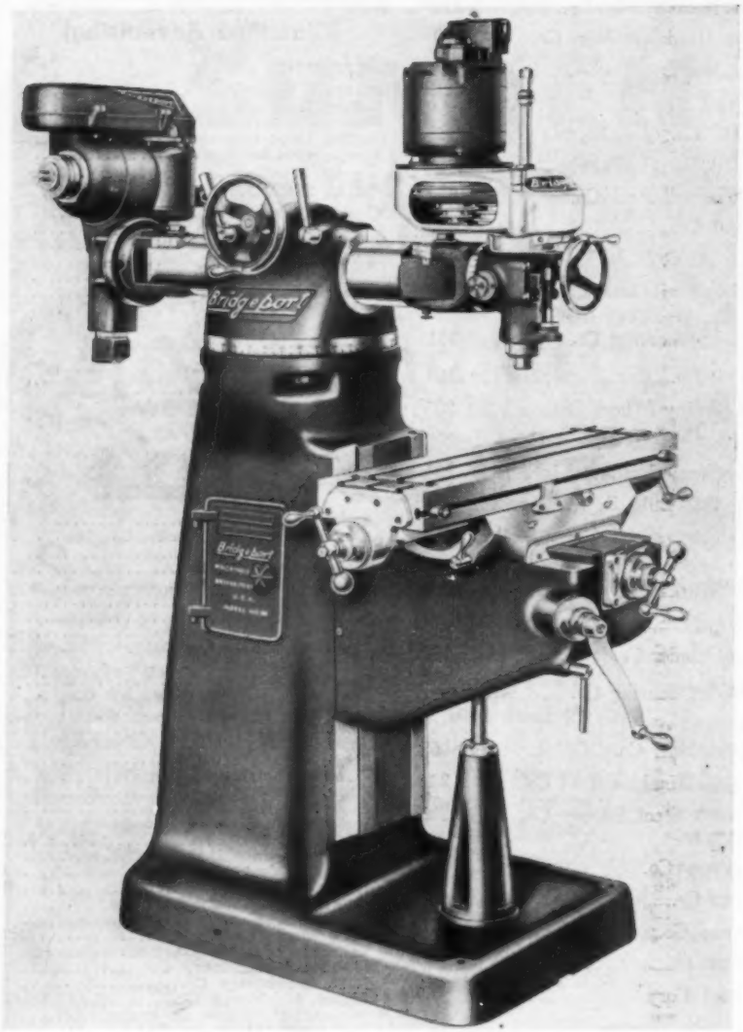
ADVERTISERS INDEX

Aaron Machinery Co.	247
Alexander & Fiden Machy. Co., Inc.	253
Bennett Machinery Co.	248
Botwinik Brothers Inc.	246
Botwinik Bros. of Mass., Inc.	250
Brooks Inc., B. D.	251
Brownell, Hazard	251
Capitol Machinery Corp.	244
Cincinnati Machinery Co.	244
Clearwater, Bank of	248
Columbia Axle Co.	246
Continental Salvage & Machy. Corp.	251
Cox Machinery Co.	250
Dictaphone Corp.	253
Dony Machinery Co.	248
Eastern Machinery Corp.	243
Emerman Machinery Corp.	242
Falk Machinery Co.	241
Goldberg, H.	253
Harrison Machinery Exchange Inc.	246, 250, 253
Hill-Clarke Machinery Co.	249
Howarth Machinery Co.	250
Hyman & Son, Joseph	253
International Commodities Corp.	240
Koontz, H. J.	253
Lang Machinery Co.	253
Lehmann Machine Co.	253
McDonald Machinery Co.	244
Miles Machinery Co.	244
Morey Machinery Co.	245
National Machinery Exchange	246
O'Connell Machinery Co.	242
Osborne & Sexton Machinery Co.	242
Paul's Machinery Co.	250
Price-Thomas, Inc.	248
Reynolds Machinery Co.	251
Schultz & Anderson Co.	253
Sier-Bath Gear & Pump Tool Co.	248
Simmons Machine Tool Co.	251
Tillery Gear Works	253
U. S. Steel Furniture Mfg. Corp.	253
Victor Machinery Exchange	251
Vimalert Company, Ltd.	253
West Penn Machinery Co.	248
Winston Machinery Co., Inc.	253

Definite need was responsible for the Creation of the

Bridgeport

TURRET MILLING MACHINE



THIS modern machine was developed to provide production facilities in a single unit which would ordinarily require the use of several single-purpose machines. "Bridgeports" have enabled small shops to avoid the necessity of installing a number of machines to handle a wide range of work; they have provided the tool rooms and production lines of large shops with the means of relieving other machines of work which can be better and more economically handled on "Bridgeports."

Regardless of the size of shop in which they are installed, it is possible to get the maximum in machine hours with Bridgeport Turret Milling Machines, because they were created to mill, drill, bore and shape at all angles of the work without changing set up. Small wonder that more than 10,000 "Bridgeports" in daily service are being kept busy productionwise.

● SPECIFICATIONS

Longitudinal Feed . . . 20" with standard 32" table. Cross Feed . . . 9". Vertical Feed of Knee . . . 16". Tables 36", 42" and 48" are available; also longitudinal power feed. Weight with Shaping Unit . . . 2000#.

Bridgeport MACHINES, INC.

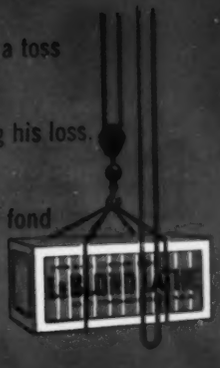
Bridgeport, Connecticut

'twas the night before Christmas

'Twas the night before Christmas
When all through the shop
Not a pulley was turning
Complete was the stop.
And over the tooling
The workmen with care
Had hung up their socks
Hoping St. Nick would be there.

Now the boss in the meantime
With satisfied glee
Had a plan of his own
Of what was to be.
To speed up his plant
And loosen the spell
That tied up production
And profits as well.

So quick as a flash
With a heave and a toss
He threw out the lathes
That were causing his loss.
And in the front door
With a look really fond
He pulled in the crates
Marked "Made by LeBlond."



Then into the places
That now were made bare
He set the "LeBlonds"
With the greatest of care.
When finished he rose
With a satisfied grin
For the very best Christmas
Was now to begin.

A Christmas to span
Over many a year.
A Christmas they'll welcome
With hearty good cheer.
"It's the very best gift
I could give them," said he,
"The one gift that pleases
Both workmen and me."

Just wait 'til the boys now
Go back to the line.
They'll trim every record
For product and time.
Economically smart . . .
It is foresighted thrift.
The mark of a genius.
In short . . . It's a gift.

THE R. K. LeBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO

Reproduces contours accurately with the help of 24 TIMKEN® bearings

ACCURACY of reproduction is the first consideration in this "American" hydraulic shaft-duplicating lathe. By using 24 Timken® tapered roller bearings in its construction, The American Tool Works Company has assured precision performance that will be maintained through years of dependable service.

Timken bearings in machine tools like this offer a combination of advantages that no other bearing can duplicate. Their tapered design carries both radial and thrust loads without shaft deflection or end-movement, and permits accurate pre-loading to any desired degree. Spindles are held rigid; chatter is eliminated. The line contact between the rolls and races gives exceptional load-carrying capacity. Finishing to incredible smoothness reduces friction to a minimum.

Timken bearings normally last the life of the machine. Even after long periods of operation, wear is negligible.

The superiority of machine tools equipped with Timken bearings is recognized by users everywhere. Be sure you get Timken bearings in the machines you buy or build. Look for the trade-mark "Timken" on the bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This label on a product means its bearings are the best.

THE AMERICAN TOOL WORKS COMPANY uses a total of 24 Timken bearings on the spindle, intermediate shafts and back gear shafts of this "American" Hydraulic Shaft-Duplicating Lathe.

GENERATED UNIT ASSEMBLY

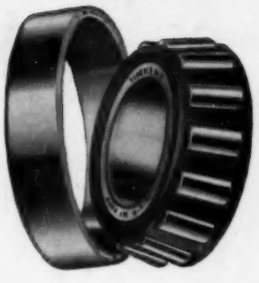
An extra step in the manufacture of Timken bearings—after assembly—results in a natural and true geometric contact being generated between all rotating parts.

This perfect mating of the component parts—cone, rolls and cup—assures positive roll alignment, long lasting precision, permanent adjustment and smooth operation.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



'L NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION